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[Rumyantzev (P. D.).] **Румянцев (П. Д.). On the Biology of *Lithocolletis populifoliella* Tr. in the Conditions obtaining in Moscow.** [*In Russian.*]—*Zool. J.* **13** no. 2 pp. 257–279, 18 figs., 6 refs. Moscow, 1934. (With a Summary in German.)

In 1930–31 the Tineid, *Lithocolletis populifoliella*, Tr., caused serious damage to poplars in Moscow, where the moths begin to overwinter under the bark of the trees or in dwellings in July or August. In the following May, when the average temperature is 13–15°C. [55·4–59°F.], they emerge and pair on the trunks and leaves of poplar and other trees. In the laboratory, oviposition occurred 6–17 days after pairing, 16–32 eggs being laid singly (although 23–32 sometimes occurred together) chiefly on the lower surface of the leaves. At a temperature of 17–18°C. [62·6–64·4°F.] and a relative humidity of 80–83 per cent. the eggs hatched in 6–8 days. In dry weather they failed to hatch and were not viable after 3–4 days. The young larvae at once mined in the leaf where, after moulting four times, they pupated. At 17–19°C. [62·6–66·2°F], larvae lived without food for 1–5 days. The pupal stage lasted 7–9 days and the complete life-cycle 39–45 days. In 1930 and 1931 large numbers of larvae pupated in June–July. Some moths that emerge early oviposit in July, but the larvae that hatch are killed by the weather or by parasites. Before hibernating, the moths collect in masses on the poplars, where they remain for several days. In some cases, as many as 74 per cent. of the larvae were parasitised by the Eulophids, *Sympiesis sericeicornis*, Nees [*cf. R.A.E.*, A **17** 573], *Chrysocharis boops*, Thoms., *Eulophus* sp., and *Winnemana* sp., and a Pteromalid, *Habrocytus* sp.

[Polezhaev (V.).] **Полежаев (В.). The Struggle for Existence in *Lithocolletis populifoliella*, Tr.** [*In Russian.*]—*Zool. J.* **13** no. 3 pp. 485–506, 15 figs., 6 refs. Moscow, 1934. (With a Summary in German.)

A study of the conditions that affect the survival of larvae of *Lithocolletis populifoliella*, Tr., on poplar in Moscow [*cf.* preceding abstract] showed that larval mortality may be as high as 80 per cent.; it depends on competition for space and food and on fungous diseases and insect parasites, which last attack the older larvae. In 1933 oviposition began on 10th June and had ceased by the end of the month. Both oviposition and hatching are governed by meteorological conditions and by the size of the leaves, large leaves with a thick layer of parenchyma being preferred. Over-population of leaves causes mortality, together with the early withering of the leaves and consequent lack of food. Many of the young larvae are killed by a fungus that causes death in 3–4 days and is favoured by warm, damp weather. The chief of the 10 species of parasites noted was a new species of *Chrysocharis*. This Eulophid paralyses the host larva and oviposits either on or near it.

[Kulagin (N. M.).] **Кулагин (Н. М.). The Insect Pests of Moscow and the surrounding District in 1872–1932.** [*In Russian.*]—*Zool. J.* **13** no. 3 pp. 453–472, 33 refs. Moscow, 1934. (With a Summary in German.)

The first part of this paper comprises a list, with notes on development and seasonal abundance, of the insect pests recorded in Moscow and its neighbourhood during 1872–1932. In the second, an account

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is given of outbreaks of various insect pests in the Russian Union, the earliest date referred to being 1836. In the third, the author discusses factors influencing outbreaks and gives information on the temperature conditions in Moscow during the 60 years under consideration and their effects on some of the insects concerned.

PAILLOT (A.). **Modifications cytologiques et organiques engendrées chez les pucerons par les hyménoptères parasites.**—*C. R. Acad. Sci. Fr.* **199** no. 24 pp. 1450–1452, 2 refs. Paris, 1934.

Examination of Aphids parasitised by Hymenoptera showed in all cases a more or less complete disappearance of the reproductive organs soon after the beginning of the development of the parasite larvae. There was, however, no important modification in the secondary sexual characters. A further phenomenon was the production of giant cells having their origin in the sexual cells. The beginning of the formation of such giant cells was difficult to observe. The author was able only on one occasion to observe a mass of germinal cells in course of dispersal in a young viviparous female of *Periphyllus* (*Chaitophorus*) *aceris*, Koch, parasitised by *Aphidius ribis*, Hal.

Entomology—*Bull. Utah agric. Exp. Sta.* no. 250 (Rep. 1932–34) pp. 44–51, many refs. Logan, Utah, September 1934.

Much of the information given in this summarised report of work on insect pests in Utah during 1932–34 has been noticed from numerous other sources. Of the cocoons of the alfalfa weevil [*Hypera variabilis*, Hbst.] collected from 15 lucerne fields during June–July 1932, 70·84 per cent. were parasitised by *Bathyplectes curculionis*, Thoms., but 7·79 per cent. of 706 pupae of the parasite were themselves attacked by Chalcidoids, 1–6 emerging from each. Large numbers of warrior grasshoppers [*Camnula pellucida*, Scud.] hatched in mid-June 1932 in pasture lands in one locality, and later in the season adults were distributed over most of the area within a radius of 15 miles, including a district consisting mostly of lucerne fields. A smaller swarm, which appeared in the meadows about 1st June 1933, was largely destroyed by a poison bran bait. Outbreaks of *Loxostege sticticalis*, L., on lucerne were related to the occurrence of Russian thistle [*Salsola*], from which the larvae migrated in search of food. In 1932, two or three large swarms of *Anabrus simplex*, Hald., migrating from mountains or foothills, completely destroyed all crops, including lucerne, maize and potatoes, grown on the side of a river. Poison bran bait was used on a small scale but few of the crickets were killed. *Bruchophagus gibbus*, Boh. (*funebris*, How.) was scarcer in 1933 than it had been for 7 summers, since less of the first crop of lucerne was left for seed, the individuals overwintering in shattered seed left after harvest were destroyed by cultivation, and chaff stacks were not left in the field over the summer as they had been during previous years. It was parasitised to a small extent by *Eutelus bruchophagi*, Gah., *Habrocytus* sp. *Liodontomerus perplexus*, Gah., and *Eupelmella vesicularis*, Retz. In experiments against *Lygus pratensis*, L., *Adelphocoris superbus*, Uhler, and *Frankliniella occidentalis*, Perg., early cutting of the lucerne for hay gave better results than any other cultural treatment. Dusting with black colloidal sulphur appeared to repel *Adelphocoris*.

SEVERIN (H. H. P.) & FREITAG (J. H.). **Ornamental Flowering Plants naturally infected with Curly-top and Aster-yellows Viruses.**—*Hilgardia* **8** no. 8 pp. 233–260, 17 figs., 4 pls., 23 refs. Berkeley, Calif., September 1934.

Natural infection with curly-top was demonstrated in 14 species of ornamental flowering plants (belonging to 10 families) in California by experiments in which previously non-infective individuals of *Eutettix tenella*, Baker, transmitted the virus from them to healthy beet seedlings. In a similar manner 8 species (of 4 families) were shown to be naturally infected with aster yellows by means of *Cicadula divisa*, Uhl., which transmitted the disease to aster or celery.

SEVERIN (H. H. P.). **Weed Host Range and Overwintering of Curly-top Virus.**—*Hilgardia* **8** no. 8 pp. 263–280, 8 figs., 2 pls., 13 refs. Berkeley, Calif., September 1934.

Lists are given of numerous annual and perennial plants growing wild in uncultivated plains and foot-hills or in cultivated areas in California that have been found naturally infected with curly-top or have been infected experimentally, and the importance of some of them as reservoirs in which the virus overwinters is discussed. The virus was repeatedly recovered by *Eutettix tenella*, Baker, from two perennials (*Atriplex* and *Chenopodium*) during tests lasting six months and a year, respectively. Cultivated plants that are naturally infected and in which the virus may overwinter are potato, lucerne, parsley (*Petroselinum hortense*) and horse-radish [*Cochlearia armoraciae*]. Non-infective leafhoppers failed to transmit the virus to sugar-beets from 5 species of ornamental plants that were naturally infected. Most of the male leafhoppers die during the winter, and the females do not remain infective throughout their life, but if they reinfect themselves during the winter, the virus overwinters in them. In an experiment the average period of infectivity during the adult life of 10 females that had been reared on diseased beets was 83·9 days, followed by an average of 50·1 days between the last infection and death of the insect.

QUAYLE (H. J.) & EBELING (W.). **Spray-Fumigation Treatment for Resistant Red Scale on Lemons.**—*Bull. Calif. agric. Exp. Sta.* no. 583, 22 pp., 15 graphs, 9 refs. Berkeley, Calif., August 1934. [Recd. January 1935.]

Experiments in the control of *Aonidiella aurantii*, Mask., were carried out during 1931–33 in California to compare the value of spray-fumigation [*cf. R.A.E.*, A **16** 118; **23** 32] with spraying alone and with two fumigations. In the 1931–32 experiments, 13 lemon groves with 6 different plots of 25–30 trees each were treated with tank-mixture sprays made of a medium or a heavy oil at $1\frac{1}{2}$–$2\frac{1}{2}$ per cent. (4 oz. blood albumen to 100 U.S. gals. spray being used as a spreader), or with 2 per cent. proprietary oil emulsions. Fumigation with hydrocyanic acid gas at dosages of 22 to 24 cc. HCN (20 cc. HCN corresponding roughly to 1 oz. sodium cyanide, 51–52 per cent. cyanogen, which is the usual dose for an average-sized lemon tree) followed each of the sprays in all groves at intervals of from 4 days to 8 months. Graphs for each set of experiments show the results

of examinations of fruits and branches after spraying but before fumigation, and of further examinations 10 days after fumigation. After oil sprays in August and September, 8·17–27·2 per cent. of the scales on branches survived, and 4–7·4 of those on fruits. The best results were obtained when the trees were fumigated 10 and 15 days after spraying, and fumigation should either follow spraying at this interval or be postponed until January–March. The average percentages of scales killed in all the experiments were 72·8–91·9 on the branches and 91·6–97·5 on the fruit by sprays alone, 97·18–100 and 91–100 by a single fumigation, 99·42–100 and 97·35–100 by two fumigations, and 99·63–100 and 98·86–100 by spraying followed by fumigation. A 2 per cent. oil spray lifted 15 per cent. of the scale coverings by the day after treatment and 18 per cent. by the second day. Artificial lifting of scale coverings did not kill the Coccids, but when they were fumigated in the laboratory the mortality among them was 50 per cent. greater than among normal scales. When rooted lemon cuttings were fumigated without previous spraying or 1–2 weeks after a 1⅔ per cent. heavy oil spray had been applied, the results showed that the oil spray appeared to have no effect on the injury caused by fumigation. Although there is conflicting evidence from the field, the author believes that oil spraying tends to decrease the injury caused by subsequent fumigation, and thinks that even if this is not so sprays should precede fumigation, since trees can best tolerate spraying in August and early September and fumigation can be postponed to a much later date. Tabulated results are given of a study in the decline of scale population on 10 trees in each of 16 groves after spraying in September 1931, and fumigating in the same month and in March 1932; counts were made of the number of individuals per unit area of branch before spraying, six weeks later, and in the spring after fumigating. The tests were repeated in 1932–33 in 8 of the groves, the plots previously treated with a 2½ per cent. medium oil being again sprayed in August 1932 and fumigated (using 22 cc. HCN) 10 days later. When the terminal 12 inches of 20 green twigs and 20 mature fruits were examined in April 1933, a high degree of commercial control seemed to have been obtained in two years in heavily infested and resistant areas. In tests in September 1932, when counts were made on the four main branches of each tree, only two live scales were found on 10 trees that had been sprayed and fumigated as compared with 16 on those that had been fumigated twice. Since the insect is most difficult to kill by HCN when it is in its second moult, the main factor in double fumigation is the interval between applications; the shortest interval should be about two weeks. The results of these experiments show that heavy infestations can be reduced and controlled by repeated treatments with sprays and fumigation.

ESSIG (E. O.) & HOSKINS (W. M.). **Insects and other Pests attacking Agricultural Crops.**—*Circ. Calif. agric. Ext. Serv.* no. 87, 155 pp., 108 figs. Berkeley, Calif., September 1934.

This circular replaces those parts of one already noticed [*R.A.E.*, A **12** 275] that dealt with insects, mites and other pests attacking agricultural crops in California. The main portion contains brief descriptions, and in some cases discussions of the bionomics and control, of insects and other pests, which are arranged so far as possible

under their food-plants. A brief section deals with pests and diseases of importance in bee-keeping. The use of insecticides for control is discussed in some detail, and a general index is included.

HASEMAN (L.). **Entomology.**—*Bull. Missouri agric. Exp. Sta.* no. 340 (Rep. 1932–33) pp. 46–51. Columbia, Mo., September 1934.

The results of spraying experiments against the codling moth [*Cydia pomonella*, L.] on apples in Missouri in 1932 are tabulated; subsequent spray recommendations have already been noticed [*R.A.E.*, A **22** 360]. Bands treated with beta naphthol dissolved in oil showed no marked tendency to repel the larvae and killed 92–99 per cent. of those that entered them. A home-made lye soap (4 U.S. quarts water, 4 lb. stale lard and 1 lb. lye) used at the rate of 1 lb. to 5–8 U.S. gals. water gave better results against the tarnished plant bug [*Lygus pratensis*, L.] on strawberry and proved cheaper than sprays of a potash vegetable oil soap with or without nicotine sulphate [*cf.* **21** 651]. Seedling cucurbits were effectively protected from the striped cucumber beetle [*Diabrotica melanocephala*, F.] by dusts of undiluted lead arsenate or calcium arsenate, lead arsenate and hydrated lime (1 : 5) or calcium arsenate and gypsum (1 : 15). Nicotine as a spray or dust gave the best results against the melon aphis [*Aphis gossypii*, Glov.]; infested hills must be treated promptly. In dry, hot weather dust barriers were the cheapest and most readily available means of stopping the migration of the chinch bug [*Blissus leucopterus*, Say] to maize, but in case of rain or where the soil could not be pulverised, chemical ones were necessary [*cf.* **14** 166 etc.].

ELMORE (J. C.), DAVIS (A. C.) & CAMPBELL (R. E.). **The Pepper Weevil.**—*Tech. Bull. U.S. Dep. Agric.* no. 447, 27 pp., 16 figs., 13 refs. Washington, D.C., September 1934.

The distribution and incidence of *Anthonomus eugenii*, Cano, which does great damage to pepper (*Capsicum*) in California, are discussed, and all stages are described. The adults eat holes in the buds and tender pods and also feed on the leaves and even on the bark of green stalks near the ground in autumn and winter; the larvae consume the contents of the buds and pods and the pod wall. Infested buds and pods fall, and late crops and those intended for winter production may sometimes be entirely destroyed. Flight has been observed throughout the year. The food-plants of the weevil are limited to the genera *Capsicum* and *Solanum*; egg-plant (*S. melongena*) may occasionally be attacked and black nightshade (*S. nigrum*) commonly supports large populations throughout the year, some migration occurring to it in autumn and from it in late spring about the time that the first pepper buds begin to form. The adults pass the winter on the food-plants, and become active on warm days.

Eggs are laid singly in the buds or pods within 2–8 days of pairing, which occurs about 2 days after emergence. In the laboratory 25 females deposited 28–634 eggs each during 16–129 days. Temperatures of 60°F. sustained for 4–5 days in March and April caused the ovaries to develop, even in the absence of material for oviposition; at lower temperatures pepper buds and nightshade berries acted as a stimulating factor. The eggs hatched on an average in 4·3 days; the larval stage

averaged 6·4, the prepupal 4·9 and the pupal 4·7 days. Pupation occurs in the bud or pod. The percentage of males ranged from 45 to 72 but was usually over 50. During the active season from mid-April to October, a generation from egg to egg occupies 22–46 days. Development may be retarded or prevented by excessive dryness or moisture, and the weevils may be killed by the drying up of infested buds and fallen pods in summer or by the rotting of pods that are washed to the lower end of the row during irrigation. The number of generations a year varies from 2 or 3 to 8, and there is considerable overlapping. Natural enemies, which include 2 Hymenopterous parasites of the larvae, are of little importance.

Calcium arsenate dust proved satisfactory in control, but its use would necessitate the removal of residue; fluorine dusts (cryolite, potassium fluoaluminate and barium fluosilicate) were even more toxic, but they all injured the plants and reduced the yield [*cf.* **22** 95]. Cultural methods appear to be the best, and serious infestation has been prevented for 3 years by disking and ploughing soon after harvest (and not later than 15th January) and by destroying nightshade.

HAAS (A. R. C.). **Relation between the chemical Composition of Citrus Scale Insects and their Resistance to Hydrocyanic Acid Fumigation.**—*J. agric. Res.* **49** no. 6 pp. 477–492, 1 fig., 21 refs. Washington, D.C., 15th September 1934.

In view of the possibility that the resistance to hydrocyanic acid gas shown by certain scale insects of *Citrus* [*R.A.E.*, A **22** 99, etc.] may be related to chemical reactions between their constituents and hydrocyanic acid, experiments, the technique of which is described, on the organic and inorganic composition of scale insects were carried out in California during 1931–33. From the number of scale insects present and their composition some idea may be formed of the loss in constituents caused to plants by infestation. Collections of infested fruit and twigs used in the studies were made in both resistant and non-resistant areas.

The following is taken mainly from the author's summary of the analysed results: *Citrus* scale insects accumulate within themselves a much higher concentration of a given constituent than is found in the adjacent part of the affected food-plant. During the growth of the shoots, there is a temporary depletion of the soluble carbohydrates and organic reserves, as well as of the inorganic constituents of the mother twigs; the loss of these constituents may render the plants less resistant to fumigation while the scales become more resistant according to the nature of their food supply [*cf.* **11** 81]. No relation was found between the ability of Coccids to resist fumigation and their organic or inorganic iron or (ash) phosphorus content. *Citrus* scale insects contain a considerable amount of copper, and there are indications that scales resistant to cyanide may contain less copper than the less resistant scales. On lemon, non-resistant scales were found to contain more wax than the resistant scales. The percentage of crude chitin was about the same in all the insects. A large part of a scale insect consists of material that is soluble in a boiling solution of strong alkali. The concentration of total nitrogen in *Aonidiella aurantii*, Mask., is considerably higher than that of total sulphur or phosphorus. The concentration of potassium in *A. citrina*, Coq., was nearly double that in *A. aurantii*.

Young (P. A.). **Penetration, Distribution, and Effect of Petroleum Oils in Apple.**—*J. agric. Res.* **49** no. 6 pp. 559–571, 2 pls., 1 fig., 18 refs. Washington, D.C., 15th September 1934.

To supplement research on injuries caused to apple by oil emulsions [*R.A.E.*, A **22** 33], investigations were made in Montana in 1926 on the rate of oil penetration into the leaves and the distribution of petroleum oils in apple tissues. In these experiments dissimilar undiluted oils were used.

The following is taken from the author's summary: Oils passed freely from oiled leaves of apple into their twigs, and were widely distributed in and between the parenchyma cells and in the tracheae of leaves and their twigs. Oil was found in a stem 488 days after the leaves had been sprayed. Oils in the intercellular spaces in parenchyma tissues retard the diffusion of oxygen and carbon dioxide, and oils in the tracheae retard the distribution of water. Petroleum oils with viscosities of 50 to 108 seconds penetrated apple leaves and made translucent spots within 2 to 60 seconds. Oily spots in leaves were translucent and yellowish green by transmitted light and blackish green by reflected light. Oils injected into apple limbs were found 9–12 months later in annual rings 5 to 88 cm. from the points of injection. Drops of oil on apple fruits penetrated through the lenticels and passed between the fruit-parenchyma cells.

The main symptoms caused by oils in apple leaves were brown and dry green spots, epiphyllous purple and white spots that indicated very toxic oils, and dwarfed growth; the leaves sometimes died. In apple limbs, buds, twigs and bark died, and narrow canker lines and yellow grey blisters appeared in the bark. The toxicity of an oil to apple is modified by the resistance of the protoplasm, the oil concentration above the amount tolerable, the temperature and the duration of oil action on protoplasm. Large amounts of oils passing from the leaves into their twigs usually killed the twigs within 9 months. Low-viscosity oils penetrated apple leaves more quickly than those of high viscosity, but there was no apparent correlation between viscosities ranging from 38 to 410 seconds and the extent of injury to the leaves.

The toxicity of an oil depends mostly on its sulphonatable parts. With unsulphonatable oils as the standard of comparison, toxic effects of oils in apple leaves were accurately and quickly determined by placing drops of each undiluted oil on the lower surface of normal, mature apple leaves, so that the probable injurious effects of an oil can be tested before it is used commercially. Oils that killed large parts of leaves within a week were too injurious for use in sprays on apple leaves.

McDaniel (E. I.). **The Control of certain Household Pests with Poison Bran Bait.**—*Quart. Bull. Mich. agric. Exp. Sta.* **17** no. 2 pp. 67–71, 5 figs. East Lansing, Mich., November 1934.

Several pests that have been troublesome in houses in Michigan during the last few years, including woodlice, particularly *Armadillidium vulgare*, Latr., millepedes chiefly of the genus *Julus*, *Otiorrhynchus* (*Brachyrrhinus*) *ovatus*, L., and *Gryllus domesticus*, L., of which only the cricket is actually injurious, were attracted by modifications of a bait of ½ U.S. pint sodium arsenite solution and 1 U.S. pint molasses

stirred into about 1 U.S. gal. water and then mixed with 12 lb. bran with the addition of 1 oz. amyl acetate. The quantity of molasses should be doubled for woodlice, oil of apple substituted for amyl acetate for millepedes and the weevil, and $\frac{3}{4}$ lb. salt added for the cricket. The stock solution of sodium arsenite is best made by slowly adding 4 lb. caustic soda (lye) to 1 U.S. gal. warm water and stirring in $12\frac{1}{2}$ lb. white arsenic. Since the pests prefer moist dark places, they may be prevented from entering houses by placing the bait under boxes, boards, etc., or even in trenches dug near the foundations and covered with sacks or loose earth.

Hutson (R.). **Grasshopper Control Pays.**—*Quart. Bull. Mich. agric. Exp. Sta.* **17** no. 2 pp. 72–74, 1 fig. East Lansing, Mich., November 1934.

In 1934, 2,412 tons of poisoned bran baits were used against grasshoppers in 29 counties of Michigan at a total cost of about £12,000 with an estimated saving of over £300,000. The grasshopper populations have been reduced where sufficient bait was available, but further measures will be necessary in 1935 to avoid re-infestation.

Russell (T. A.). **The Palmetto Scale Situation.**—*Agric. Bull. Bermuda Dep. Agric.* **13** no. 10 pp. 77–78. [Hamilton] October 1934.
Russell (T. A.). **The Use of Parasites against the Palmetto Scale.**—*T. c.* no. 11 pp. 84–85. November 1934.

Although infestation of palmetto [*Sabal*] in Bermuda by *Comstockiella sabalis*, Comst. [*cf. R.A.E.*, A **22** 253, 306] continues to spread, its severity has recently decreased. It appears that when the scale reaches a new area, injury is at first very severe and may kill old trees, but is later checked by parasites. The scale is rarely detected until the mature females have become established on leaf-blades or stalks, where they congregate underneath the sheath of brown fibre. The scales only move into the open when they are overcrowded. Until better control measures can be devised, spraying with oil emulsion is being continued and its efficiency may be increased by removing dead leaves, trash and as much brown fibre as possible.

In December 1933 one parasite, *Aphytis fuscipennis*, How., was found in all areas, and two others, *Physcus* sp. and *Encarsia portoricensis*, How., were captured in two places, where the scale was also less numerous. Both have now been introduced and established in some severely infested areas. The badly infested palmettos on which the parasites were first placed are now free from scale, and the parasites have spread to neighbouring palms.

Seín, jr. (F.). **Paring and Heat Sterilization of the Corms to eliminate the Banana Root Weevil** *Cosmopolites sordidus* **Germar.**—*J. Agric. P.R.* **18** no. 3 pp. 411–416, 1 pl., 2 figs., 2 refs. Rio Piedras, P.R., 27th October 1934.

Most of the information in this paper on the treatment of banana seed-corms in Porto Rico in order to ensure their freedom from infestation by *Cosmopolites sordidus*, Germ., has already been noticed [*R.A.E.*, A **23** 93]. Experiments showed that immersion or fumigation

[**19** 686; **22** 539] of the suckers is unreliable or unpractical, but that all stages of the weevil may be killed without injury to the plant tissues by sterilisation at 43°C. [109·4°F.] for 8 hours in a circulating saturated atmosphere. This may prove to be a practical method.

Wolcott (G. N.). **The Diapause Portion of the Larval Period of *Diaprepes abbreviatus* L.**—*J. Agric. P.R.* **18** no. 3 pp. 417–428, 2 figs., 1 ref. Rio Piedras, P.R., 27th October 1934.

A description is given of the technique of rearing *Diaprepes abbreviatus*, L. [*R.A.E.*, A **22** 154] from larva to adult. The number of larvae hatching from different egg-clusters and the number of instars through which they pass vary greatly, but in the laboratory all became mature, ceased feeding and entered an "active diapause" about 100–125 days after hatching. In this stage they are at first restless, churning up the soil; they then rest in an oval, horizontal chamber, but become active when disturbed. Those derived from eggs that hatched in summer or early autumn usually pupated during March–April, in cells constructed vertically in the soil. It therefore appears that the life-cycle in Porto Rico usually occupies a year, since females are most abundant in late spring and early summer, and their progeny develop in the autumn, remain in the prepupal diapause throughout the winter, pupate in the following spring, and soon emerge as adults. Larvae that hatch later in the year do not become adult until the second spring following. Some adults, however, do not appear above the ground and begin oviposition until the autumn or winter, and this explains the presence of egg-clusters throughout the year.

Tetrastichus haitiensis, Gah., parasitises 95 per cent. of the late spring and early summer eggs, and appears to be chiefly responsible for the variation in the habits of *D. abbreviatus*. It becomes rapidly less numerous as the season advances and is rare during winter and spring. It is thus mostly the progeny of the exceptional adults that survive. This explains the more pronounced seasonal abundance of *Diaprepes* where all the land is planted with sugar-cane, since under these conditions the eggs are laid between sugar-cane leaves, the tough tissues of which protect them from the parasite [*cf.* **22** 699]. In sugar-cane areas hand-collection of the adults may be limited to the period of abundance, but in *Citrus* nurseries it should be practised throughout the year, as otherwise in addition to the injury to the leaves of seedlings by the beetles in spring, the roots will be damaged by the larvae.

Wolcott (G. N.). **Lima Bean Pod-borer Caterpillars of Puerto Rico on their wild Hosts.**—*J. Agric. P.R.* **18** no. 3 pp. 429–434, 2 refs. Rio Piedras, P.R., 27th October 1934.

Collections of mature pods of *Crotalaria incana* on sandy beaches in Porto Rico throughout the year beginning June 1933, during which period no lima beans were grown commercially on the Island, showed that infestation by *Etiella zinckenella*, Treit., reached 100 per cent. in most cases, dropping below 90 per cent. only during February–April to a minimum of 60 for a small number of pods on 15th April. This seasonal variation appears to correspond roughly with that previously observed on lima beans, on which the Pyralid is scarce during winter and early spring [*R.A.E.*, A **22** 153], and was further indicated by more detailed observations on an artificial planting.

Plants in a locality with heavy clay soil were less severely infested or free from infestation. The eggs are laid between the hairs usually in the keel-shaped depression on the upper surface of the pods, as many as 8 and often 3–4 occurring on a single pod, though only one larva is usually found inside. Only one instance of parasitism by *Trichogramma minutum*, Riley, was observed in the hundreds of eggs examined. The larvae feed on the hairs and outer skin before burrowing into the pod, where they consume the immature seeds.

Cassia occidentalis and the wild beach sword bean, *Canavalia maritima*, were heavily infested by *Fundella cistipennis*, Dyar ; and on 1st December damage by the larvae was noticed on the buds and flowers as well as the young pods of the latter plant. As many as 7 eggs were found on a single calyx. On *Cassia* the eggs may be laid on the lower surface of tender leaves, but are more usually found at the base of the young pods when flower sprays are present. The eggs and the young larvae of both borers are briefly described. A pyrethrum spray had no effect on the eggs or young larvae of either, but experiments with *Etiella* showed that it may be of value in preventing oviposition. Larvae of *Fundella* are readily susceptible to drowning, since all those in pods immersed overnight in water were dead by morning.

Wolcott (G. N.). **The Larvae of** *Lycaena theonus* **Lucas feed on the Buds and Flowers of Lima Bean and** *Crotalaria incana* **in Puerto Rico.**—*J. Agric. P.R.* **18** no. 3 p. 435, 1 ref. Rio Piedras, P.R., 27th October 1934.

Leptotes (*Lycaena*) *theonus*, Lucas [*cf. R.A.E.*, A **19** 570] is recorded for the first time from Porto Rico. Larvae were found eating the flowers and buds of a few lima bean plants on 2nd August 1933 in one locality, and adults were observed alighting on plants of *Crotalaria incana*, one depositing an egg on the top of a flower spray on 28th December. Several larvae were also discovered in another locality among the immature pods of *Crotalaria*, on which they may have been feeding though it is more probable that they were attacking the buds and flowers.

Wolcott (G. N.). **The present Status of White Grub Parasites in Puerto Rico.**—*J. Agric. P.R.* **18** no. 3 pp. 436–441, 2 figs., 6 refs. Rio Piedras, P.R., 27th October 1934.

The status in Porto Rico of the parasites of white grubs, which have been largely controlled on sugar-cane by the toad, *Bufo marinus* [*R.A.E.*, A **22** 155], is discussed with reference to the observations of W. F. Jepson [**22** 620] compared as far as possible with those of H. E. Box [**15** 409]. The Tachinids, *Eutrixoides jonesi*, Walt., and *Cryptomeigenia aurifacies*, Walt., were abundant at one time, but of large collections of grubs made in 1933 none was parasitised by the former and only 1 per cent. by the latter. Attention was therefore paid to Scoliids, of which *Campsomeris dorsata*, F. (a parasite of the Dynastid, *Ligyrus tumulosus*, Burm.) was successfully transported to Mauritius and released [*cf.* **22** 621], some females having survived a journey of 53 days and lived for over 40 days after arrival. *C. dorsata* was thought to be abundant only on the south coast of Porto Rico,

but on 7th June large numbers of males were found swarming in 5–6 clusters on *Casuarina* on the north coast, this being the first record of males swarming. The Scoliid is most numerous in this locality, where conditions are unfavourable for the toad but suitable for *Ligyrus*, because of the abundance of horse and mule manure for the larvae. In another part it has almost completely disappeared because *Bufo* has practically eliminated its host.

Páez C. (J.) & Lamas C. (J. M.). **Informe sobre el viaje de Inspección a los cultivos de Algodón de los Valles de Supe y Pativilca.** [Report on the Journey of Inspection to the Cotton Plantations in the Supe and Pativilca Valleys.]—*Inf. Est. exp. agric. Minist. Fom. Peru* no. 26, 24 pp., 8 figs. Lima, July 1934. [Recd. January 1935.]

In the Pativilca Valley, Peru, *Dysdercus ruficollis*, L., caused a loss of 30 per cent. of the cotton crop up to an altitude of about 500 ft. and 27 per cent. above this level. In the Supe valley the loss was 34 per cent. The larvae of a Tachinid, *Acaulona peruviana*, Tns., and of an unidentified fly parasitised 8–35 per cent. of the bugs. Mites were found on more than 50 per cent. of the adults but did not appear to affect them appreciably. Minor cotton pests observed included *Aphis gossypii*, Glov., which was favoured by relatively low temperatures, and *Gasterocercodes gossypii*, Pierce, which was found on ratoon. The measures advised against *D. ruficollis* include proper timing of sowing and other cultural operations, the eradication of wild food-plants such as *Sida paniculata*, on which it occurs from April to July, and direct control with suitable sprays or dusts.

Test House in Panama resists attack of Termites and Decay.—*Wood Pres. News* **11** no. 1 pp. 4–5, 13, 2 figs. Chicago, Ill., 1933. (Abstr. in *Exp. Sta. Rec.* **71** no. 5 p. 668. Washington, D.C., November 1934.)

No sign of termite attack was found by J. Zetek in October 1932 in a house constructed during 1926 in a tropical jungle in the Panama Canal Zone on an island on which 30 wood-destroying species are known to occur. The house was built of southern yellow pine; the wood for the sills, floor joists and subflooring had been treated by the full-cell process with an absorption of 12 lb. coal-tar creosote per cu. ft., and that for other parts by an empty-cell process with an absorption of 8 lb. per cu. ft., or with zinc chloride with an absorption of not less than 0·5 lb. dry salt per cu. ft.

Mimeur (J. M.). **Aphididae du Maroc (Troisième note).**—*Mém. Soc. Sci. nat. Maroc* **40** 71 pp., 14 figs., 7 pp. bibliography. Rabat, 1934. Price *Fr.*18.

A list is given of all the Aphids hitherto recorded from Morocco, together with their food-plants, brief notes being added where possible on their morphology, biology and natural enemies. New species described include *Cinara maghrebica* on *Pinus halepensis* and *P. canariensis*, and *Lachnus* (*Pterochlorus*) *lepineyi* and *Myzocallis boudyi* on *Quercus ilex* and *Q. ilex* var. *suber*.

Insect Pests and their Control.—*Agric. Gaz. N.S.W.* **45** pt. 11 pp. 624–628, 6 figs. Sydney, 1st November 1934.

These notes, which belong to a series on insect pests in New South Wales [*cf. R.A.E.*, A **23** 54], deal with the bionomics and control of *Ceratia* (*Aulacophora*) *hilaris*, Boisd., on cucurbits, *Phthorimaea operculella*, Zell., on potatoes, *Nezara viridula*, L., on tomatos and beans, *Caliroa limacina*, Retz., on cherries and pears and more rarely on quinces and hawthorn, *Phyllocoptes oleivorus*, Ashm., on *Citrus*, and the bed-bug, *Cimex lectularius*, L.

Jarvis (H.). **Spraying Experiments for the Control of Fruit Fly in the Stanthorpe District.**—*Qd agric. J.* **42** pt. 4 pp. 470–472; also as *Pamphl. Div. Ent. Dep. Agric. Stk Qd* no. 18, 3 pp. Brisbane, 1st October 1934.

Owing to the absence of *Dacus ferrugineus*, F. (*Chaetodacus tryoni*, Frogg.) on apples in Queensland sprayed with nicotine sulphate and white oil against the codling moth [*Cydia pomonella*, L.] in 1932–33, about 1 gal. of a spray of ½ pint nicotine sulphate, ½ gal. white oil and 40 gals. water was applied four times (on 7th, 12th, 19th and 28th February 1934) to each of 40 trees at a pressure of 250–300 lb. Infested fruits were not observed on sprayed trees until harvest but were found on untreated ones from a week after the date of the first application; at a final examination, after the apples had been stored for 3 weeks, only 0·9 per cent. of those from the treated trees showed injury compared with 75·9 per cent. of those from untreated ones. The repellent action of this spray was further demonstrated by minor experiments in another district.

Veitch (R.). **Grasshopper Control.**—*Qd agric. J.* **42** pt. 4 pp. 512–513; also as *Adv. Leafl. Dep. Agric. Stk Qd* no. 14, 3 pp. Brisbane, 1st October 1934.

In September 1934, hoppers hatched in abnormally large numbers in southern and south-western Queensland from eggs laid by winged grasshoppers in May. A bait of 4 lb. molasses and 24 lb. bran poisoned with ½ lb. sodium arsenite dissolved in 3 gals. water should be used while the damage is relatively unimportant and before the winged stage is reached. This amount is sufficient for ⅔ acre. The bait should be broadcast over infested ground or applied in strips 30–50 ft. wide in front of migrating hoppers at times when they are active and hungry. Mortality begins 24 hours after consumption, and the rate is high after 48 hours. As a temporary measure against dense swarms of young hoppers, old bags sprinkled with kerosene and set alight may be dragged across infested areas.

Chevalier (A.). **Elevage des Fourmis en Indochine pour la défense des Orangers.**—*Rev. Bot. appl.* **14** no. 159 pp. 977–978. Paris, November 1934.

In Cambodia, Indo-China, Poilane observed that *Citrus* fruits are protected from injury by various insect pests by the introduction of predacious red ants, which make nests on the trees of leaves fastened together. He thinks that the odour emitted by the nests repels the

insects. The trees are joined by wires so that the ants can pass from one to another, and here and there are hung small receptacles holding water and various foodstuffs for them during the dry seasons.

CHIU (Shin Foon). **A Preliminary Report on Insect Pest Survey of Kwangtung Province South China.** [*In Chinese.*]—*Ent. Bull. Coll. Agric. Sun Yatsen Univ.* no. 1, ii, 2, 62 [3] pp., 1 fldg map, 10 fldg tables, text ill., 68 refs. Canton, China, September 1934. (With a Summary in English.)

As a beginning of a survey of insect pests in Kwangtung Province, data (which are shown in a table) were obtained from eight districts during July and August 1933 on the nature and extent of the injury caused by 155 species. Of these by far the most important was *Schoenobius bipunctifer*, Wlk. (*incertellus*, Wlk.), which caused a very great reduction in the spring crop of rice in 1933. At harvest, infested stems should be gathered or cut down to soil level. The other species of great economic importance were *Chilo simplex*, Butl., and *Melanchra* sp. on rice, *Termes formosanus*, Shir., which attacked *Eucalyptus robusta*, sugar-cane and deciduous fruit trees, *Diatraea* sp. and *Eucosma* (*Olethreutes*) *schistaceana*, Sn., on sugar-cane, *Melanauster chinensis*, Forst., and *Icerya purchasi*, Mask., on *Citrus*, *Tessaratoma papillosa*, Dru., and *Mimela* sp., on litchee [*Nephelium litchi*] and lungan (*Euphorbia logana*), a moth (probably *Dendrolimus spectabilis*, Butl.) on pine (*Pinus massoniana*) and *Arctornis chrysorrhoea*, L. (*Porthesia similis*, Fuess.) on mulberry. Despite the occurrence of annual crop losses of 10–20 per cent., little attention has been paid in the Province to measures of prevention and control, though locally grown tobacco is extensively used as an insecticide. Of 83 other plants reputed to have insecticidal properties, four, *Croton tiglium*, *Rhododendron sinensis*, *Millettia pachycarpa* and *Polygonum* sp., have been studied and found of value against certain insects. Since many of the injurious species are thought to have been introduced, strict quarantine measures should be immediately enforced.

CHU (Joo-tso) & CHIN (Shing-mu). **Notes on a Mulberry Twig Borer and Experiments in its Control (Lep. Aegeriidae).** [*In Chinese.*]—*Ent. & Phytopath.* 2 no. 32–33 pp. 627–640 4 figs. Hangchow, China, 21st November 1934. (With a Summary in English.)

Ceratocorema sp., an Aegeriid recently found infesting mulberry in Chekiang and Kiangsu, has only one generation a year and hibernates in the larval stage. The adults appear about the end of June and lay eggs on the bases of the leaf petioles. The larvae bore downward into the twigs and make a series of openings for excrement. The most effective control is to inject into the openings oil, calcium cyanide dust or a 5 per cent. solution of potassium cyanide.

VAN DER MEER MOHR (J. C.). **Entomologische aanteekeningen, IV.**—*Meded. Deli Proefst.* (2) **90** pp. 1–19, 3 figs. Medan [1934]. (With Summaries in English.)

A key is given to the apterous viviparous females of the commoner Aphids occurring in the tobacco districts of Deli, Sumatra. This is supplemented by a brief description of each species with a record of

its food-plants, and a list of the food-plants showing the Aphids found on them.

Notes are given on *Cicindela aurulenta*, F., *C. holosericea*, F., and *C. minuta*, Ol., which are common in the tobacco fields but do no harm. Young larvae of the tobacco stem-borer, *Phthorimaea heliopa*, Lw., reared on *Solanum melongena* (egg-plant) and *S. mammosum* all died before pupating, though some had bored into the shoots and petioles.

LABRIEU (G.). **Contribution à l'étude de** *Scutigerella immaculata* **Newport.**—*Rev. Zool. agric.* **33** nos. 9–11 pp. 129–142, 149–158, 167–174, 10 figs., 18 refs. Bordeaux, September–November 1934.

This study, which is based on the literature as well as on the author's observations in France, deals with the morphology, anatomy, distribution, bionomics and control of *Scutigerella immaculata*, Newp. [*R.A.E.*, A **14** 378; **16** 518; **20** 42]. In Landes it chiefly injures beans and maize and is most numerous at the end of May and beginning of June, when maize germinates. During cold weather it descends deep into the soil, migrating upwards to feed when humidity combined with the presence of maize seeds provides favourable conditions. Often nothing is left but the husk of the seed, and in many cases where germination does occur the plants are weakly and soon die, but the damage to plants 15 days old before the attack is not appreciable. *Scutigerella* can live for a long time in the absence of its customary food-plants, provided that a certain degree of moisture is maintained. Although primarily phytophagous, it seems to feed on such animal food as protozoa, worms and rotifers, and on decomposing organic matter when the normal diet is not available. It can withstand immersion for a considerable period, but is soon killed by drought. In samples of soil taken at 6 a.m. several individuals were feeding on the roots of newly-germinated lettuce seedlings; an hour later when the sun had risen they had all descended to a depth of 9–12 inches where there was a layer of decaying stubble; and in the afternoon it was impossible to find any. This explains why a cold rainy period following the sowing of maize increases the injury caused, since it not only delays the growth of the plants but also affords conditions favourable for infestation. Farmers in Landes do not now apply manure before sowing maize or beans, as they think it attracts *Scutigerella*.

A discussion of control mesaures tried in Europe and America shows that no entirely satisfactory method has yet been devised. Apart from flooding, which is only practicable under certain local conditions, and the use of carbon bisulphide, which is slow and costly, the best results have been obtained by soil fumigation with calcium cyanide, and by coating the seeds at the time of sowing with a repellent [*cf.* **17** 183; **20** 357].

FEYTAUD (J.). **Les appâts toxiques contre les vers gris.**—*Rev. Zool. agric.* **33** no. 11 pp. 161–167, 2 refs. Bordeaux, November 1934.

Methods of controlling cutworms attacking tobacco are discussed from the literature. Poison baits are now generally used, but as

arsenicals are little favoured in France, tests on *Euxoa* (*Agrotis*) *segetum*, Schiff., which causes considerable damage in south-western France, were carried out in 1933 with 5–10 per cent. mixtures of barium fluosilicate and bran. This bait, scattered along the rows at the rate of 18 lb. per acre, reduced injury by 80–90 per cent. and numbers of dead larvae were observed. The larvae appeared to eat the bait more readily when it was moistened with dew, and it acted better in valleys where the dew fell earlier in the evening. In 1934, further tests, in which arsenical baits were used for comparison and the quantity of barium fluosilicate was raised to 20 per cent., confirmed these results.

Melis (A.). **L'uso delle gabbiette di allevamento e delle bacinelle spia per stabilire l'epoca più propizia dei trattamenti arsenicali contro la** *Cydia pomonella* **L.** [The Use of Breeding Cages and Bait Trap Pans to determine the most suitable Date for applying Arsenicals against *C. pomonella*.]—*Note Fruttic.* **1935** nos. 4–6, reprint 31 pp., 2 figs., 25 refs. Pistoia, 1935.

The combined use of breeding cages and bait-pans for ascertaining the best time for applying arsenical sprays against *Cydia pomonella*, L., is discussed with reference to previous work in the United States [*R.A.E.*, A **16** 24; **20** 583] and Italy. Breeding cages should be used to determine moth emergence and bait-pans to ascertain moth activity [**20** 132]. As a result of his observations in Tuscany, both alone and with Pieri and Videsott [**20** 437], the author concludes that the interval between the fall of petals and the emergence of the moths is different on apple and pear and requires checking each year. Breeding cages are suitable for following the development of the moth in spring and thus ascertaining the peak of emergence, but it is suggested from facts observed in Tuscany, that it may be well to see whether development in the cages proceeds at the same rate as in nature. Bait-pans are well suited for gauging moth activity in the orchard, and consequently determining the days of maximum oviposition. Spraying should be carried out 5–10 days later.

In recent experiments the author found that a 20 per cent. solution of vinegar, a 10 per cent. solution of molasses, or water in which bran (13 oz. to 1 gal.) had been steeped until fermentation began was a satisfactory bait. Spraying should be especially directed against the larvae of the first generation, and an application immediately after the fruit has formed will control the few that hatch early.

Tibor (I.). **A búzapoloska kártételének minöségromboló hatása.** [The Action of Injury by Wheat Bugs in reducing the Quality of Wheat.]—*Mezögazdasági kutatások* **5** no. 1 pp. 13–30, 5 figs. Budapest, January 1932. (With a Summary in German.) [Recd. December 1934.]

A detailed account is given of experiments in Hungary on the effect on gluten content and quality of wheat of damage by Pentatomids. Subsequent papers on this subject have already been noticed [*R.A.E.*, A **22** 331, 332]. Tests were made of mixtures of punctured and undamaged grain. Damage to 75 per cent. of the grains in a mixture reduced its gluten content by 45 per cent. The effect on quality is even more marked, as 20 per cent. damage reduced it by 50 per cent., and 50 per cent. damage had almost as serious an effect as 100 per

cent. Bakery tests confirmed the results obtained in the laboratory. Germinating power was also impaired, only 53 per cent. of punctured grains germinating as compared with 99 per cent. of sound ones.

Gömöry (S.). **Mi okozza a poloskás búza minöségromlását ?** [The Causes of Deterioration in the Quality of Wheat infested by Cereal Bugs.]—*Mezögazdasági kutatások* **7** no. 2 pp. 37–47, 5 figs., 4 refs. Budapest, February 1934. (With a Summary in German.)

The damage done to wheat by Pentatomids in Hungary in 1933 [*cf. R.A.E.*, A **22** 331, 332] was greatly reduced and fell to about 1–3 per cent., partly owing to unfavourable hibernation conditions and partly to an increase of the egg-parasite, *Telenomus* sp.

This article is mainly devoted to a discussion of the chemical aspects of the effect of attack by these bugs on the milling, baking and other qualities of the grain and flour.

Tomaszewski (W.), Nitsche (G.) & Langenbuch (R.). **Die Bekämpfung der Kohlfliegen** *Chortophila brassicae* **Bché. und** *Ch. floralis* **Fall.** [The Control of the Cabbage Flies, *Phorbia brassicae* and *P. floralis*.]—*Arb. physiol. angew. Ent. Berl.* **1** nos. 3–4 pp. 229–242, 280–290, 6 figs., 50 refs. Berlin, October & December 1934.

In a large area under cabbage near Nauen, Germany, *Phorbia* (*Chortophila*) *brassicae*, Bch., occurred on a clay and sand soil and on moorland soil, while *P.* (*C.*) *floralis*, Fall., was almost entirely confined to the latter. The difference in the beginning and duration of the flight period is of importance in the control of these flies, and data on this subject were obtained by trap-jars baited with a mixture of 1 part fermented fruit juice, 3 parts water, and a little sugar. Only the males were counted, as the females are almost indistinguishable from each other and from those of allied species [*cf. R.A.E.*, A **22** 247]. The adults from the overwintered pupae of *P. brassicae* appeared on the clay-sand soil at the end of April and disappeared after 2–3 weeks. The first generation larvae injured early cabbage in the nurseries and fields. The second and third generations were unimportant economically and would not, as a rule, require control. The one annual flight period of *P. floralis* lasted from mid-July to mid-September. One application of control early in spring suffices for *P. brassicae*, while *P. floralis* requires several in summer.

Various published methods of control were tried, and the results are discussed with reference to the literature. Biological and cultural control are said to be impracticable. A 0·06 per cent. solution of mercury bichloride was fully effective when applied at the right time [*R.A.E.*, A **21** 180]. Fields planted during the flight-period should be treated not more than 4 days after planting. The date for nurseries and fields previously planted can only be ascertained by regular examination of the plants for eggs. A technique for applying the solution by means of knapsack sprayers is described. Calomel (mercurous chloride), organic preparations of mercury, naphthalene, and a tar distillate (creolin) mixed with sand were ineffective. Some (but not all) tar distillates gave even better results than mercury bichloride, but their efficiency is apparently more liable to be affected by weather and is in any case less lasting, so that they have to be applied more than once.

MAYER (K.). **Die letale Dosis Aethylenoxyd bei** *Calandra granaria*, *Tribolium confusum* **und** *Cimex lectularius*. [The lethal Dose of Ethylene Oxide for *C. granaria*, *T. confusum* and *C. lectularius*.]—*Arb. physiol. angew. Ent. Berl.* **1** no. 4 pp. 257–266, 2 figs., 14 refs. Berlin, December 1934.

An account is given of experiments with ethylene oxide in the form of T-gas (10 parts ethylene oxide and 1 part carbon dioxide) [*R.A.E.*, A **21** 436] made to determine its effect on insects and to discover if a reduction in fumigation time [B **21** 60] was possible. In order to avoid errors, the test insects were exposed for a given time to a stream of air containing a known quantity of T-gas and supplied by an exact apparatus which is described and figured. The insects were then kept under observation for several days to ascertain the period during which the delayed action of ethylene oxide occurs [B **20** 80], and it was found that an allowance of 10 days was ample with *Calandra granaria*, L. (adults), *Tribolium confusum*, Duv. (larvae and adults), and *Cimex lectularius*, L. (eggs, larvae and adults). The results of the 23 tests made are tabulated. With low concentrations the delayed action occurred up to the 10th day, whereas with high concentrations it generally took place on the second and third days. Haber's formula, in which the working effect of the gas is obtained by multiplying the concentration in mg. per cubic metre by the fumigation time in minutes required to produce mortality, proved applicable to investigations with insects and the toxicity curve of ethylene oxide resembled that of phosgene. In order of increasing resistance were the egg of *C. lectularius*, the egg of *Ephestia*, the adult of *C. granaria*, the adult of *C. lectularius*, the larva of *T. confusum*, the adult of *T. confusum*, and the larva of *C. lectularius*. In the case of *Cimex*, the larva was nearly twice as resistant as the adult and seven times as resistant as the egg.

HORN (W.). **Ein zweiter Beitrag über Insekten, welche Blei, besonders Bleimäntel von Luftkabeln, durchbohren.** [A second Contribution on Insects that bore into Lead, especially Lead-sheathing of Aerial Cables.]—*Arb. physiol. angew. Ent. Berl.* **1** no. 4 pp. 291–300, 8 figs. Berlin, December 1934.

An abstract is given of the author's previous paper on insects boring into lead [*R.A.E.*, A **21** 533], and further instances are recorded from various parts of the world. During 1933 and 1934 unsuccessful attempts were made to capture the beetles injurious to the lead-sheathing of aerial electric cables in the Baden Rhine plain. Only one case of such injury occurred in Baden in 1934. Aerial cables in Greece were damaged in three cases by the Bostrychid, *Sinoxylon sexdentatum*, Ol. Wall cables in Montevideo, Uruguay, were repeatedly bored into near a corn mill where *Calandra oryzae*, L., *C. granaria*, L., and *Tribolium ferrugineum*, F., were numerous. Some of the weevils were received in Berlin, and the lead capsule containing them and their food (oats, etc.) was also found to contain adults of *Ephestia kühniella*, Zell., bred from eggs in the food. One of the moth larvae had gnawed into an edge of the lead sheet, making an indentation 2·5 mm. wide and 0·8 mm. deep. An account is given of injury in 1933 to aerial telephone cables in Brazil, including a boring typical of the larva of *Megaderus stigma*, L. A lead cable near Berlin was found injured by some insect in September 1933. In another case

in Germany it was almost certain that *Hylotrupes bajulus*, L., had continued boring from a telegraph post into the lead of a cable attached to it. Attention is also drawn to a statement that old lead and copper roofs in Italy are often found bored by Coleoptera.

TORKA (V.). *Pristophora alnivora* **Htg.**—*Arb. physiol. angew. Ent. Berl.* **1** no. 4 pp. 301–304. Berlin, December 1934.

This is a record of observations in Upper Silesia on the sawfly, *Pristophora alnivora*, Htg., attacking the leaves of *Aquilegia*. The larvae were parasitised by the Tachinid, *Ptychomyia selecta*, Mg., and a Eulophid. An account is given of the oviposition by the sawfly in the leaf-tissue; the average number of eggs laid by one individual was 47.

NOËL (L.). **Observations sur la ponte de la grande teigne des ruches, *Galleria mellonella*.**—*Bull. Soc. zool. Fr.* **59** no. 5 pp. 436–447, 2 figs., 2 refs. Paris, 28th December 1934.

In the laboratory fertilised females of *Galleria mellonella*, L., were definitely attracted to wax from bee-hives, whereas males were not. Most of the eggs were laid in cracks 0·2 mm. wide. The ovipositor and the manner of oviposition are described.

HERIOT (A. D.). **The Renewal and Replacement of the Stylets of sucking Insects during each Stadium, and the Method of Penetration.**—*Canad. J. Res.* **11** no. 5 pp. 602–612, 14 figs., 9 refs. Ottawa, November 1934.

A description is given of the way in which the stylets of Coccids and Aphids are renewed at moulting and of the mechanical insertion of these structures into hard tissues. It is suggested that the stylets are propelled forward by successive short holds caused by the joint action of the labrum and labium. With Aphids the main function of the stylet muscles is directional control of the tips, enabling a short stylet to explore a large area; with Coccids the absence of this control is compensated for by the provision of longer stylets. Directional control allows of selective feeding, giving rise to a sense of taste, which is manifest in specific types of injury to food-plants and also in a modification in the insect of accessory structures of the mouth.

FOLSOM (J. W.) & WARDLE (R. A.). **Entomology with special Reference to its Ecological Aspects.**—4th revd edn, Demy 8vo, ix + 605 pp., 5 pls., 308 figs., 32 pp. refs. Philadelphia, Pa, P. Blakiston's Son & Co., Inc.; London, John Murray, 1934. Price 21*s*.

In his revision of this book [*cf. R.A.E.*, A **11** 343], the junior author has left unchanged the general structure, but has added much new information and re-modelled several chapters, particularly those dealing with the relation of insects to disease and to man. The addition of many new references to the bibliography, which is arranged under subjects, has necessitated the deletion of many of the old ones, but all of historical or general value have been retained. Indices to authors and subjects are appended.

Mameli (E.). **Nuovi insetticidi di origine vegetale.** [New Insecticides of Vegetable Origin.]—*Costa Azzurra agric. flor.* 1934 no. 11. (Abstr. in *Agric. colon.* **28** no. 12 p. 656. Florence, December 1934.)

A table is given showing the plants (other than pyrethrum and tobacco) from which insecticidal extracts are obtained, the countries in which they occur, and the extracts obtained from them.

Nitsche (G.). **Die Blutlaus und ihre Bekämpfung.** [The Woolly Aphis and its Control.]—*Kranke Pflanze* **12** no. 1 pp. 2–4, 1 pl. Dresden, January 1935.

This is a popular account of *Eriosoma* (*Schizoneura*) *lanigerum*, Hsm., on apple in Germany, where several unsuccessful attempts have been made to control it by means of *Aphelinus mali*, Hald. [*cf. R.A.E.*, A **22** 430].

Deutschmann (F.). **Die Blutlauszehrwespe in Südmähren.** [The Woolly Aphis Parasite in South Moravia.]—*Kranke Pflanze* **12** no. 1 pp. 4–6. Dresden, January 1935.

Aphelinus mali, Hald., was imported from Italy into a warm, dry area in southern Moravia in the autumn of 1933 and became so well established that by the end of July 1934 no woolly Aphids [*Eriosoma lanigerum*, Hsm.] were observed on apple trees. A few appeared in September, but the parasite was also present.

Kunike [G.]. **Ein neues wirksames Spritzmittel zur Kornkäferbekämpfung.** [A new effective Spray against the Grain Weevil.] —*NachrBl. dtsch. PflSchDienst* **15** no. 1 p. 1. Berlin, January 1935.

When wool-fat is dissolved in a Soxhlet apparatus with an excess of acetone, a mixture of soft fat remains in solution after cooling, while the hard fat, chiefly cholestrin, is precipitated as a hard wax. After this has been removed, the solvent can be recovered by quantitative distillation. One part of the soft fat, when mixed with 4 parts of a 1 per cent. soap solution produces a stable emulsion that causes 100 per cent. mortality in grain weevils [*Calandra granaria*, L.] sprayed with it. The liquid is neither inflammable nor poisonous. The odour and the colour of the soft fat can be removed by means of charcoal. The solution must not be sprayed on the grain itself.

Klee (H.) & Rademacher (B.). **Der Stand der Weizengallmückenbekämpfung nach Untersuchungen in Schleswig-Holstein.** [The Position of Wheat Gall-midge Control according to Investigations in Schleswig-Holstein.]—*NachrBl. dtsch. PflSchDienst* **15** no. 1 pp. 3–6, 3 figs. Berlin, January 1935.

A comprehensive account is given of the results of experiments in 1931–34 against the wheat gall-midges, *Contarinia tritici*, Kby., and *Sitodiplosis mosellana*, Géh., in various parts of Schleswig-Holstein, but particularly in the island of Fehmarn, where, between 1930 and 1934, 10–20 per cent. of the wheat crop was lost and the quality was so reduced that in 1933 one variety had only 21 per cent. of moist starch in the seeds instead of 28. The measures tested were primarily

those designed to kill the larvae after they had migrated to the soil. Some of the earlier work has been noticed [*R.A.E.*, A **21** 39].

As the larvae cannot be counted, estimates were made by trapping the emerging adults in 350 low frames 19 ins. square, over the top of which muslin coated with banding adhesive was stretched.

Cultivation alone was not effective. Of the fertilisers tested Kainit at the rate of about 900 lb. per acre killed 66 per cent. of the larvae, and a mixture of 540 lb. kainit and 270 lb. calcium cyanamide killed 66·1 and on one occasion 77 per cent. The mixture is more satisfactory because there is no excess of either fertiliser. It can be equally well applied before or after autumn ploughing or in spring. Top dressing in May with calcium cyanamide against weeds in summer wheat is common in Fehmarn, and about 90 lb. per acre killed up to 51·8 per cent. of the larvae, while 180 lb. killed up to 60·6. The sowing of clover among wheat, another local practice, makes it difficult to destroy the larvae by manuring, but if cattle are pastured on the young clover from early spring until the time when the gall-midges emerge, the ground is so closely packed that most of the adults are unable to reach the surface. In one test 64·1 per cent. were thus prevented from appearing. The midges preferred certain varieties of wheat, and while trap-belts are impracticable, it is suggested that Garnet, an American early summer wheat, be sown at an early date among the usual crop to attract the midges at the beginning of June. At the end of June, when this wheat should be cut for fodder, many of the larvae hatched from eggs laid in the ears would be destroyed.

The date of sowing did not influence infestation. It is dangerous to use wheat chaff as a humus manure in dry years, because some larvae remain in the ears and are carried with the chaff to grass land where they enter the ground. Chaff should be used as fodder or composted.

Trappmann (W.) & Nitsche (G.). **Beiträge zur Giftwirkung von Rotenon und Pyrethrinen auf verschiedene Insekten.** [Contributions on the Toxic Action of Rotenone and Pyrethrins on various Insects.]—*NachrBl. dtsch. PflSchDienst* **15** no. 1 pp. 6–7. Berlin, January 1935.

Of recent years tests in Berlin have shown that, contrary to the results of some other investigators, insecticides containing pyrethrin are superior to those containing rotenone. Of the insects used in previous work, *Calandra granaria*, L., and *Tenebrio molitor*, L., are too resistant to contact poisons, and Aphids not sufficiently so, for comparisons to be made. Furthermore, equal quantities of the active principles were not always used, and sometimes the effect of emulsifiers and spreaders was disregarded.

In these experiments the rotenone- or pyrethrin-content of the dusts and sprays was 0·15 per cent., and they were applied with special apparatus [*R.A.E.*, A **18** 701; **22** 385]. The test insects were chiefly larvae of various Lepidoptera and Coleoptera, and the results both for dusting and spraying showed the superiority of pyrethrins over rotenone and also differences in susceptibility of different species. For instance, in spraying experiments, rotenone killed 98 per cent. of *Bombyx mori*, L., in 6 days and pyrethrin 100 per cent. in 4 days,

whereas rotenone killed only 15 per cent. of *Nygmia phaeorrhoea*, Dön. (*Euproctis chrysorrhoea*, auct.) in 8 days while pyrethrin killed 100 per cent. in 6.

THIEM (H.). **Richtlinien zur Vernichtung der Puppen der Kirschfruchtfliege (*Rhagoletis cerasi* L.) durch Behandlung des Bodens.** [Directions for the Destruction of the Pupae of the Cherry Fruit-fly by Treatment of the Soil.]—*NachrBl. dtsch. PflSchDienst* **15** no. 1 pp. 8–9. Berlin, January 1935.

When wild food-plants (*Lonicera tatarica* and wild cherry) are removed for the control of *Rhagoletis cerasi*, L., in Germany, the pupae in the ground beneath them should be destroyed to prevent infestation of neighbouring cherry trees during the next two summers. The ground should be watered between August and mid-May with 1 gal. to 6 sq. ft., or enough to penetrate uniformly to a depth of 4 ins., of an emulsion made by pouring a mixture of 8 fl. oz. tetrachlorethane with 2 fl. oz. of an oil soap containing spirits into 5 gals. water. Tar distillates also give good results, but are not so effective as the emulsion. The pupae occur half a yard beyond the area under the crown of *L. tartarica*. On bare ground they do not usually occur more than $1\frac{1}{4}$ ins. below the surface, but they have been found at depths of about 5 ins. in chalky soil.

Cherries are more satisfactorily protected by picking the fruit at the right time, but if the emulsion be used, it should not come into direct contact with any part of the trees.

DINGLER (M.). **Ueber die pflanzenbaulichen Grundlagen zur Bekämpfung der Spargelschädlinge.** [On the cultural Fundamentals connected with the Control of Asparagus Pests.]—*Landw. Jb.* **80** no. 2 pp. 275–291, 24 figs. Berlin, 1934.

The methods of cultivating asparagus in Hessen are outlined. Infestation by the asparagus fly [*Platyparea poeciloptera*, Schr.] is not severe after the plants are three years old [*R.A.E.*, A **22** 726]. Crops grown between the rows can have an important effect on infestation [**21** 641], but dwarf beans are the only plants that do not injure asparagus and also protect it and improve the soil.

HEY (G. L.) & THOMAS (F. J. D.). **On the Biology of some Tortricidae (Lepidoptera) infesting Fruit Trees in Britain. I.** *Cacoecia* (*Tortrix*) *podana* **Scop.**—*J. Pomol.* **12** no. 4 pp. 293–310, 2 pls., 1 fig., 42 refs. London, December 1934.

Records of the distribution of *Tortrix* (*Cacoecia*) *podana*, Scop., and of its occurrence on fruit and other trees and shrubs in England are reviewed, and descriptions are given of the eggs, seven larval instars and pupae. Dyar's Law [*R.A.E.*, A **20** 579; etc.] is, within certain limits, applicable to the larvae. The eggs are laid in batches of about 50 on the upper surface of the leaves, one female laying a maximum of 8 batches containing about 365 eggs. In Kent in 1933 and 1934, eggs were first observed in mid-June and larvae towards the end of the month. In the first instar, the larvae usually infest the lower surface of the leaves, and in the second, they generally feed between two leaves spun together, but they may attach a leaf to the surface of a fruit, and feed on the skin and surface layers. In

the third, they show a greater tendency to attack the fruit in autumn, and usually feed inside the fruit buds in spring; they hibernate in cocoons beneath a bud scale, in the crotch of a twig or in a dead leaf bound to a twig. In the fourth instar, they penetrate the opening buds, often destroying the blossoms; and in the fifth, sixth and seventh, they attack the leaves, blossoms and young fruit, sheltering in two leaves webbed together and pupating there. In the autumn the larvae may be carried into the packing sheds and stores with apples or other fruit; they continue to feed on these, and after hibernating in cracks in the boxes and amongst wrapping paper, they again attack the fruit in the spring and give rise to adults. Pupation sometimes occurs in the sixth instar, but usually in the seventh. In 1933 and 1934 pupae were first found towards the end of May and adults in the first half of June. Pairing occurred 2 days after emergence and oviposition after a further 4.

In England, the damage caused in spring to foliage and fruit is considered to be less important than that done in autumn to the surface of apples, pears, plums, and sometimes damsons. This has recently increased, particularly on apple, and in some areas the Tortricid is a major pest. No damage to the fruits has been observed on cherry, quince, walnut, raspberry, blackberry or hawthorn, though infestation has been noticed on the leaves of all but quince [*cf.* **22** 585]. Control measures are discussed with reference to investigations by other workers. Observations showed that lead arsenate sprays are ineffective, as a satisfactory deposit cannot be obtained where the larvae feed. Following routine sprays of 10 and 5 per cent. tar distillate, 64 and 38 per cent. of the larvae collected from prunings were dead. Parasites only kill a small percentage of the larvae; those obtained from them were the Braconids, *Macrocentrus abdominalis* F., *M. thoracicus*, Nees, *Macrocentrus* sp., *Apanteles longicauda*, Wsm., and *Apanteles* sp., the Ichneumonids, *Omorgus* (?) *bilobus*, Thoms., and *Pristomerus vulnerator*, Panz., and the Tachinid, *Nemorilla notabilis*, Mg.

Lal (K. B.). **The Biology of Scottish Psyllidae.**—*Trans. R. ent. Soc. Lond.* **82** pt. 2 pp. 363–385, 4 pls., 38 refs. London, 29th December 1934.

An account is given of the results of investigations on the bionomics of 10 Psyllids in Scotland, excluding *Psylla* (*Psyllia*) *mali*, Schm., and *P. peregrina*, Först. [*R.A.E.*, A **23** 79; etc.], namely, *P. alni*, L., and *P. försteri*, Flor., on alder, *Psyllopsis fraxinicola*, Först., and *P. discrepans*, Flor., on ash, *Psylla buxi*, L., on box, *P. melanoneura*, Först., on hawthorn, *P. pyricola*, Först., on pear, *P. ambigua*, Först., on willow, *Trioza urticae*, L., on nettle, and *Aphalara nebulosa*, Zett., on willow herb (*Epilobium*). The author considers that few, if any, of these are of economic importance. In each case the eggs and characters of the adults are described. Annotated lists are given of the Psyllids recorded from alder, ash, pear and willow.

P. alni and *P. försteri*, which have one generation a year and overwinter in the egg stage, are not economically important but may delay the development of alders in heavy infestations. *Psyllopsis fraxinicola* and *P. discrepans*, as well as *P. fraxini*, L., are capable of causing damage to ash in Scotland, but only the first becomes sufficiently numerous to cause appreciable injury. The adults appear

about mid-June and pairing occurs in 10–12 days, but oviposition does not begin until early autumn. The eggs overwinter and hatch in April when the leaf-buds are about to open. The feeding of the nymphs causes the formation of copper-coloured galls (due to the curling of the leaves), which are later inhabited by predacious earwigs and Capsids. Damage caused by *Psylla buxi* disfigures box but is of no great economic importance. The adults appear in spring and inhabit box hedges until August, when pairing and oviposition occur. The nymphs hatch in early April and become adult in about 50 days.

Observations indicated that *P. simulans*, Först., is the winter form of *P. pyricola* ; it is also thought probable that *P. pyricola* is identical with *P. pyri*, L., with occasional slight differences probably due to geographical isolation. *P. pyricola* was only found on pears even when apples were near. The hibernating adults of this Psyllid emerge from crevices in the bark early in March, pair towards the end of the month and oviposit within 3–4 days. The eggs are laid on the leaf buds and hatch in 2–3 weeks. The nymphal stage, which is passed on the lower surface of the leaves, begins in April and lasts about 5 weeks. Adults of the first generation appear in May and oviposit about mid-June in the grooves of the petioles, the eggs hatching in about 10 days ; those of the second emerge in July and those of the third in October. The generations overlap.

ROSENBERG (H. T.). **A Study of the Colonisation of *Aphelinus mali* Hald.**—*Trans. R. ent. Soc. Lond.* **82** pt. 2 pp. 415–420, 2 figs., 3 refs. London, 29th December 1934.

On 7th June 1933 twigs each bearing about 100 individuals of *Eriosoma lanigerum*, Hsm., parasitised by *Aphelinus mali*, Hald., were fastened to heavily infested trees in an apple orchard in Berkshire. A decrease in the numbers of Aphids was first apparent on 17th August and became considerable, especially on colonised trees, by the 31st. By 28th September, when observations (which had been made at intervals of 7–14 days) were discontinued, the infestation in the orchard was of no economic importance. Larvae of *Syrphus balteatus*, DeG., and *S. auricollis*, Mg., which were recovered from about 12 per cent. of the twigs brought into the laboratory on 6 occasions, were evidently of considerable value in the control of the Aphids. They were not observed in the field, but they are difficult to distinguish as they become covered with " wool." A single parasitic larva, resembling that of *Praon simulans*, Prov., was obtained from *E. lanigerum* on dissection ; in this connection it is noted that *P. lepelleyi*, Waterst., was recorded from this host in England in 1926. It is considered likely that the sudden decrease in infestation in August and September was due to *Aphelinus* and partly to the Syrphids, and not to the usual autumn migration to the roots, as trees were still severely infested in Surrey until the beginning of November and parasitised Aphids were collected on 15th November from espalier trees about 10 yards distant from the orchard under observation. Since larvae and pupae of *Aphelinus*, but no hibernating larvae [*cf. R.A.E.*, A **13** 178], were found on this occasion, the parasite may not be completely adjusted to English conditions ; larvae instead of hibernating may give rise to adults at a time when no hosts are available, so that populations die out during the winter.

As a result of these investigations, it is suggested that if infestation by *Eriosoma* is likely to become serious, liberations should be made by the beginning of May. A unit of about 100 larvae of *Aphelinus* placed on every fifth tree in every fifth row should be ample in an orchard where trees are 5 yards apart and where the leaves form an almost complete canopy. The distribution of twigs from colonised trees some weeks after the initial liberation may be desirable where a sufficient supply of parasites is not available, but such twigs would probably bear only a few parasitised Aphids.

Report on the Work of the Education and Research Division of the Ministry for the Year 1932–33. III. Horticulture.—*J. Minist. Agric.* **41** no. 9 pp. 863–891. London, December 1934.

This report includes a review of the legislation affecting insect pests of plants in force in England and Wales during the period 1932–33, and notes on the manner in which the various orders were put into effect during that period.

The Fruit Tree Pests (Cambridgeshire) Order of 1934.—*S.R.O.*, 1934, no. 1314, 4 pp. London, 26th November 1934.

This Order empowers Local Authorities to appoint Officers to examine any fruit trees in Cambridgeshire, in respect of which a complaint has been made that they are suspected to be affected with any of the following pests: fruit-tree Aphids, apple sucker [*Psylla mali*, Schmidb.], winter moth [*Cheimatobia brumata*, L.], codling moth [*Cydia pomonella*, L.], fruit-tree Capsids, and fruit-tree red spiders [*Paratetranychus pilosus*, C. & F.]. If the fruit-trees are infested, the occupier of the premises may be required to treat them in a manner which shall be prescribed, or to destroy them by fire.

Sarra (R.). **Notizie biologiche della** *Platycleis grisea* **F. (Orth.-Phasgonuridae).**—*Boll. Lab. Zool. Portici* **28** pp. 197–209, 6 refs. Portici, 27th December 1934.

The Tettigoniid, *Metrioptera* (*Platycleis*) *grisea*, F., all stages of which are described, is very common in the arid region of the southern high plateau of Italy. From mid-March to early July the immature stages feed on the foliage of leguminous and graminaceous plants. The adults, which are polyphagous and occur from July to October, cause injury to cereals, not only by the number of grains they devour, but also by the large number that drop to the ground during feeding. A female lays upwards of 100 eggs, usually in dead stalks of *Asphodelus ramosus* or *Ferula ferulago*. In the laboratory during 1932–34, the eggs were very susceptible to extremes of dryness and moisture, and it is probable that the young larvae do not readily withstand cold weather. The numbers of the Tettigoniid are also reduced by predators and by a Scelionid, *Apegus kerteszi*, Kieff., and *Eupelmella platycleidis*, sp. n., which parasitise the eggs, so that it is not often found in a gregarious phase. Should this occur, a spray or bran bait containing sodium arsenite could be used on the pastures near cultivated patches. This should be supplemented by thorough collection of stalks for fuel.

Barry (T. H.). **The Indian Lac Industry.**—*Sci. Progr.* **29** no. 115 pp. 456–465, 4 refs. London, January 1935.

This general account of the lac industry in India includes notes on the bionomics of the lac insect [*Laccifer lacca*, Kerr] and adds to the list of its important host-trees [*R.A.E.*, A **19** 25] *Ficus religiosa* (pipal), *Acacia arabica* (babul) and *Cajanus indicus* (arhar). There appears to be no connection between the botanical affinity of a tree and its capacity to act as host for the lac insect. There is evidence of parthenogenetic reproduction [*cf.* **21** 131, etc.]. Lac insects bred on *Shorea talura* in southern India have 3 life-cycles in 13 months, but when brood lac from this source is transferred to northern India, the subsequent brood assumes the characteristic periodicity of the local races with two generations a year.

Davidson (J.). **Control Methods used against Locusts and Grasshoppers.**—*J. Dep. Agric. S. Aust.* **38** no. 5 pp. 619–624, 3 figs. Adelaide, December 1934.

A widespread infestation by *Chortoicetes terminifera*, Wlk., occurred during 1933–34 in South Australia, northern Victoria and western New South Wales [*cf. R.A.E.*, A **22** 565, etc.]. The permanent habitats of this grasshopper remain unknown, but they appear to be situated in the dry northern areas of South Australia, close to the line of the 10-inch annual isohyet. The general direction of migration appears to be southwards, and the occurrence of swarms in the agricultural areas of South Australia is probably only temporary. Further studies on the ecology and the periodicity of grasshoppers in Australia are necessary. The usual recommendations for control are given.

Hart (P. C.). **De topboorderinfectie van den jongen aanplant.** [The Infestation of young Sugar-cane by the Tip Borer.]—*Arch. Suikerind. Ned.-Indië*, 1934 pp. 967–993; *Meded. Proefst. Java Suikerind.*, 1934, no. 24. Surabaya, 1934.

Experiments in Java showed that larvae of *Scirpophaga intacta*, Sn., can develop into adults in planted sugar-cane slips, but as only two moths were produced in a test with about 300 slips, it is evident that infestation of young cane fields due to infested slips is negligible compared with that due to adults flying from fields of old cane. Observations in 1932–33 showed that migration from old fields occurs at intervals as the various generations mature. The moths were able to fly for over half a mile.

Tolmatcheff (V. Y.) & Alin (V. N.). **Some strange Butterflies of North Manchuria.**—*China J.* **21** no. 6 pp. 312–314, 1 col. pl. Shanghai, December 1934.

An account is given of observations during 1925–27 in Manchuria on the Uraniid, *Epicopeia mencia*, Moore, which oviposits in July–August on the lower surface of the leaves of elms. The larvae feed on the leaves in groups of 20–120 up to late September, when they pupate in cocoons in the soil surface. They hibernate in this stage, and the moths emerge in June–July.

KATSUMATA (K.). **Results of Studies on** *Rhynchites heros* **Roelofs.** [*In Japanese.*]—*Publ. Ishikawa agric. Exp. Sta.*, 45 pp., 2 pls. Kanazawa, Ishikawa-Ken, August 1934.

Descriptions are given of all stages of *Rhynchites heros*, Roel., which is common on apple throughout the Prefecture of Ishikawa, but also sometimes causes serious damage to pear, and attacks peach, plum, loquat (*Eriobotrya japonica*) and other fruits. There is usually one generation a year. The adults begin to be active in spring when the temperature rises above 10°C. [50°F.], appearing in numbers in April and May at temperatures of 13–15°C [55·4–59°F.] and pairing some 20 days later. Oviposition begins about 2 weeks after pairing and continues until late June. The female deposits usually 1 egg, but sometimes 2 or 3, in a hole in a young fruit, closes the hole, and then injures the stalk so that the fruit falls. It lays 83·3 eggs on an average and dies about a week after ceasing to oviposit. The eggs hatch in 5·8 days, and the larvae, which mature in about 3 weeks, pupate in the soil. The pupal stage lasts 3–4 weeks, but the beetles remain underground until the spring, when they feed on the buds. A few larvae do not pupate till the autumn of the year after they enter the soil. If the fruits are kept immersed in water, the eggs are not killed, but the young larvae die in 5 days, and the full-grown ones in a week. Lead arsenate sprays are most effective against the beetles in spring ; if they are not applied, the beetles and infested fruits should be collected and the sound fruits covered with bags.

KATSUMATA (K.). **Results of Studies on** *Lema oryzae* **Kuwayama.** [*In Japanese.*]—*Publ. Ishikawa agric. Exp. Sta.*, 58 pp., 2 pls. Kanazawa, Ishikawa-Ken, August 1934.

Descriptions are given of all stages of the Criocerid, *Lema oryzae*, Kuw., which since 1914 has sometimes reduced the rice crop by 10 per cent. in the Ishikawa Prefecture. It is always abundant near or among mountains, where there are suitable conditions for hibernation, and has one generation a year. The adults overwinter among grasses or fallen leaves, in cool, shady places, and feed on *Zizania latifolia* in early spring before the rice is planted. They appear in the rice-fields from May onwards and oviposit in early June, laying on an average 166·8 eggs in masses on the upper sides of the leaves during about 3 weeks. The eggs hatch in a week, and the larvae, which mature in 2 weeks, are especially abundant from June to early July. The pupal stage lasts about 10 days, and the new adults, which mostly emerge from late June to early July, feed for some days, but do not pair, before overwintering. The adults are resistant to insecticides [*cf. R.A.E.*, A **22** 238], though a pyrethrin-oil spray is effective against them. The larvae are killed by pyrethin, nicotine or derris.

KAMIYA (K.). **Studies on the Morphology, Bionomics and Hymenopterous Parasites of the Pine Caterpillar** (*Dendrolimus spectabilis* **Butl.).** [*In Japanese.*]—*Bull. For. Exp. Sta. Korea* no. 18, 110 pp., 11 pls., 24 figs. Keijo, Korea, November 1934. (With a Summary in English.)

An account is given of observations at Tokio on *Dendrolimus spectabilis*, Butl., which causes serious damage to pine in Korea and also

occurs in Japan, attacking *Larix, Cedrus, Abies* and *Tsuga*, though it prefers *Pinus densiflora* and *P. thunbergi*, especially the former. All stages are described in detail. There is one generation a year. After hibernating, the larvae begin to be active in April and pupate in late June or early July. The pupal stage lasts about 18 days, and the moths, which remain motionless during the day, are found from July to mid-September. Pairing takes place soon after emergence, and oviposition about 3 days later. The female lays an average of 582·3 eggs in 5·4 days. The larvae hatch in a week or less and begin to hibernate in November.

Parasitic Hymenoptera observed to attack *D. spectabilis* in Japan [*cf. R.A.E.*, A **20** 653] included *Phanurus* sp. and *Trichogramma dendrolimusi*, Mats., parasitising the eggs, and *Stenaraeoides* (sic) *octocinctus*, Ashm., parasitising the pupae. Special attention was paid to *Apanteles liparidis*, Bch., one of the most important parasites of the larvae. This Braconid is widely distributed in Japan, and it has four or more generations a year, of which the first and second infest *Porthetria* (*Lymantria*) *dispar*, L., and the last two *D. spectabilis*, other hosts including *Dendrolimus* spp., *Notolophus posticus*, Wlk., *Nygmia phaeorrhoea*, Dön. (*Euproctis chrysorrhoea*, auct.) and *Arctornis chrysorrhoea*, L. (*Porthesia similis*, Fuess.). The females outnumber the males when reared from *D. spectabilis*, but the males are more numerous when reared from *P. dispar*; 10–79 individuals are obtained from a single host. The female lays about 130 eggs, which hatch in 7–9 days, and the larvae mature in spring in about 4 weeks. They spin cocoons shortly after emergence and pupate within 2 days. The pupal stage lasts 17–24 days in early spring, and 4–12 later in the year.

Yokoyama (K.) & Ishii (G.). **Studies on the Mites attacking Mulberry Leaves. (2) Morphology and Biology of** *Panonychus mori* **Kishida.** [*In Japanese.*]—*Bull. seric. Exp. Sta. Japan* **8** no. 9 pp. 425–454, 1 pl. Tokyo, October 1934. (With a Summary in English.)

Panonychus mori, Kishida, is a polyphagous mite that is widely distributed in Honshu. Mulberry leaves heavily infested by it turn yellow or brown and finally wither. It has 12 generations a year, the overwintering eggs beginning to hatch about mid-April. In experiments, eggs laid by unfertilised females produced males only. The mites lay 30–70 eggs singly on the lower surface of the leaves, and those that become adult in late autumn deposit overwintering eggs round the buds. Calcium cyanide dust and various sprays, including pyrethrum extract in soap solution and potassium sulphide proved effective in control. Silkworms [*Bombyx mori*, L.] were not affected by feeding on leaves that had been treated 1–2 days previously.

Toyoshima (A.). **On the Control of** *Carposina sasakii* **Mats.** [*In Japanese.*]—*J. Plant Prot.* **21** no. 11 pp. 816–822. Tokyo, November 1934.

The adults of the Tortricid, *Carposina sasakii*, Mats. [*R.A.E.*, A **19** 602], which is very injurious to apple in the Aomori Prefecture, are attracted to light, especially violet or white light, but most of those caught by light-traps are males. The use of molasses and fruit juices as baits is not effective, but ploughing before the emergence of the

moths in early June kills the pupae and is of value in control. Covering the fruits with paper bags is also recommended, and spraying them with nicotine sulphate or derris kills many of the eggs.

HIROSE (K.). **On *Cryptodactylus gracilis* Schoenf., injurious to Chestnut.** [*In Japanese.*]—*Insect World* **38** pp. 438–440. Gifu, Japan, December 1934.

The Buprestid, *Cryptodactylus gracilis*, Schoenf., all stages of which are described, appears to have one generation a year in Japan and to hibernate in the larval stage. Pupation takes place in May and June, and the adults feed on the leaves of chestnut from late June to the end of July. They oviposit in the branches and stems, and the larvae bore into them, causing serious damage and sometimes killing the trees.

TAKAHASHI (R.). **A new Aphid of the Genus *Astegopteryx* Karsch (Hemiptera, Aphididae).**—*Mushi* **7** no. 2 pp. 68–73, 2 figs. Fukuoka, Japan, December 1934.

A description is given of *Astegopteryx takenouchii*, sp. n., on *Styrax* in Kyushu, with a key to all the species of the genus known to occur on this plant.

CLINTON (G. P.) & MCCORMICK (F. A.). **The Dutch Elm Disease, *Graphium ulmi*, in Connecticut.**—*Science* **81** no. 2090 pp. 68–70. New York, 18th January 1935.

In Connecticut, cultures of *Ceratostomella* (*Graphium*) *ulmi* were obtained from an old elm tree in the absence of *Scolytus multistriatus*, Marsh. [*cf. R.A.E.*, A **22** 392], but larvae and adults of the native Scolytid, *Hylastes* (*Hylurgopinus*) *rufipes*, Eichh. [**22** 652], as well as mites [*cf.* **22** 649], were found to carry the fungus locally, and when adult beetles were placed in test tubes with healthy twigs of elm the latter became infected.

FLUKE (C. L. jr.) & RITCHER (P. O.). **Oak Trees and the White Grub Menace.**—*Science* **81** no. 2090 p. 71. New York, 18th January 1935.

In southern Wisconsin oak-hickory climax forest coincides with the areas of pasture and maize land subject to severe damage by the larvae of 4 species of June beetles [*Lachnosterna*], the adults of which have a marked preference for certain varieties of oak, particularly burr oak [*Quercus macrocarpa*].

COCKERELL (T. D. A.). **The Western Invasion of *Samia cecropia*.**—*Science* **81** no. 2091 pp. 97–98. New York, 25th January 1935.

The author records that since *Samia cecropia*, L., became common in various districts of Colorado, where it has recently caused injury in orchards, he has seen no example of *S. gloveri*, Strecker. In Montana *S. cecropia* was found to mate with *S. gloveri*, and though the female hybrids were sterile, the males fertilised females of the parent species, which produced healthy offspring. It seems that if *S. cecropia* invades

the territory of *S. gloveri* and is 2 or 3 times as abundant, the latter will disappear, but a critical examination of numerous specimens should show traces of *gloveri* ancestry.

PIERSTORFF (A. L.) & LAMB (H.). **The Honeybee in relation to the Overwintering and primary Spread of the Fire-blight Organism.**—*Phytopathology* **24** no. 12 pp. 1347–1357, 8 refs. Lancaster, Pa, December 1934.

The following is taken from the authors' summary of investigations in Ohio made to determine if infected bee-hives can be a source of the spring infection of fire blight in orchards [*cf. R.A.E.*, A **18** 712]. Honey-bees carried *Bacillus amylovorus* from artificially inoculated blossom clusters to others on the same tree. Bees from hives that had been heavily infested with virulent cultures and placed under apple trees enclosed in cheesecloth cages did not carry the blight to the blossoms. The transfer to another locality of bee colonies that had been confined to badly infected trees did not spread the blight. The organism lived in pure honey for 5–11 days, but it was impossible to demonstrate its presence on the combs or frames or in the honey in a hive 24 hours after it had been infected with a virulent suspension. *B. amylovorus* was obtained from the heads of bees from a hive for only 2 days after it was infected.

GODFREY (G. H.). **The Confinement of Chloropicrin and other Gases for Fumigation Purposes.**—*Phytopathology* **24** no. 12 pp. 1366–1373, 1 fig., 5 refs. Lancaster, Pa, December 1934.

In tests at Honolulu on methods of confining fumigation gases to increase their lethal capacity, measured quantities of volatile chemicals were introduced in liquid form into petri dishes sealed with covers of paper coated with the various membranes to be tested. Carbon bisulphide penetrated most membranes much more readily than did chloropicrin. Casein glue was the only material tested that was highly efficient in confining the former. Tetrachlorethane was very similar to chloropicrin in its ability to penetrate membranes. Hydrocyanic acid gas diffused rather rapidly through practically all the membranes tested, and further investigations on it are needed. The ordinary animal glues were generally the most practical of the materials tested. The author obtained excellent results in killing various insect pests of stored products by fumigation in chambers sealed with glue-coated Kraft paper.

JOHNSON (E. M.). **Dissemination of Angular Leaf Spot of Tobacco by the Southern Tobacco Worm.**—*Phytopathology* **24** no. 12 pp. 1381–1383, 1 fig. Lancaster, Pa, 1934.

Rain accompanied by wind is probably the usual means of transmission of *Bacterium angulatum*, but in Kentucky in 1934 several leaves of tobacco were found with the leaf spot infection in two parallel lines, rather than scattered at random as is usual. The distance between the lines corresponded with the width between the prolegs of the larvae of *Protoparce* (*Phlegethontius*) *sexta*, Joh., which had been feeding on the leaves. The wounds made by the hooks of the prolegs form excellent foci of infection especially in the presence of moisture.

Sweetpotato Quarantine (Domestic). Notice of Quarantine No. 30 (revised).—*U.S. Dep. Agric. B.E.P.Q.* Q. 30, 2 pp. Washington, D.C., 10th October 1934.

As a precaution against the introduction of *Euscepes batatae*, Waterh., and *Omphisa anastomosalis*, Gn., the importation into the United States, of any variety of sweet potato (*Ipomoea batatas*) from Hawaii or Porto Rico is prohibited, except as authorised by the Department of Agriculture.

Dimick (R. E.) & Mote (D. C.). **The present Status of the European Earwig.**—*Mon. Bull. Calif. Dep. Agric.* **23** no. 10–11 pp. 298–300. Sacramento, Calif., 1934.

The European earwig [*Forficula auricularia*, L.] is mainly troublesome as a household pest in Oregon, but may occasionally damage cultivated plants. Examination of the digestive tracts of individuals collected in the field during the last few years showed that they feed chiefly on lichens and pollen [*cf. R.A.E.*, A **20** 594]. Good results have been reported of a bait of 12 lb. bran, 1 lb. sodium fluosilicate and 1 U.S. quart fish oil, applied during dry weather when most of the earwigs are feeding above ground, and also one of 2 U.S. gals. water, 1 lb. sodium fluoride, 2 U.S. qts. molasses and 12 lb. bran [*cf.* **16** 105], though this bait becomes less attractive as the water evaporates and has a slower action.

In Portland, where the larval parasite, *Digonochaeta setipennis*, Fall., has been liberated since 1930 [*cf.* **22** 652], the number of earwigs has been greatly reduced, but it is not yet known if the parasite is directly responsible.

Mackie (D. B.). **Treating Balled Nursery Stock to destroy Earwig.**—*Mon. Bull. Calif. Dep. Agric.* **23** no. 10–11 pp. 300–303. Sacramento, Calif, 1934.

Forficula auricularia, L., is sometimes found hidden in balled nursery stock, under the wrappings and in packing material. Experiments in California with several types of treatment showed that when balls artificially infested with 50 earwigs under the burlap were enclosed with Cyanogas calcium cyanide dust (at the rate of about 1 oz. per cu. ft. of earth ball) in bags of rubber-treated cloth [*cf. R.A.E.*, A **23** 27], all earwigs were dead after an hour's exposure. It is thought that the dosage could be reduced considerably. Balls of *Daphne odora* were covered with burlap impregnated with naphthalene (by soaking in a saturated solution of naphthalene in petrol), about ½ oz. being sufficient for a 10 lb. earth ball. They remained unattacked after exposure in heavily infested yards for 3 and 5 days, and the second lot, from which the burlap was removed, was then planted and showed no sign of injury on the tenth day.

Edwards (W. D.), Gray (K.) & Mote (D. C.). **Observations on the Life Habits of *Cnephasia longana* Haw.**—*Mon. Bull. Calif. Dep. Agric.* **23** no. 10–11 pp. 328–333. Sacramento, Calif, 1934.

The distribution and stages of the Tortricid, *Cnephasia longana*, Haw., are briefly described. In Oregon during 1930–34, the larvae were first

noticed in early spring, webbing together the petals of wild and cultivated strawberry (*Fragaria*), wild blackberry (*Rubus macropetalus*) and Dutch iris. The pupal stage occurred on the plant and lasted about a fortnight. The adults emerged in late May or June and remained active until mid-July or later. In the laboratory, pairing and oviposition took place within 2–7 days, 100–200 eggs or more being laid singly or in clusters. Since neither eggs nor young larvae have been found in the field, it is not known in which stage hibernation occurs. A list of the food-plants is given, and the damage caused to those of economic importance is briefly described. On strawberries, the larvae destroy the pollen and the developing fruit, in which they tunnel. On iris, the damage prevents the sale of cut flowers, but does not apparently affect the bulbs. On flax (*Linum usitatissimum*), the feeding of the larvae on the growing tip causes one or more new shoots to develop below it, so that the fibres are shorter. Damage to the flowers may also lower the yield of seed. The larvae cause slight injury to peas, hops, filbert (*Corylus*) and leguminous fodder-crops, and wild flowers are important sources of infestation. The Tortricid is parasitised by an Ichneumonid and a Braconid, the latter of which is apparently the more valuable.

Pyrethrum dusts and sprays on iris and strawberries and lead arsenate sprays and sodium cyanide dust on iris did not give conclusive results. Picking and destroying the blossoms while they are still infested may be satisfactory, and where this cannot be done, wild flowers might be cleared from adjacent fields and fence rows and the crops thoroughly cultivated.

Wicks (W. H.). **The Alfalfa Weevil—Its economic Importance overestimated.**—*Mon. Bull. Calif. Dep. Agric.* **23** no. 10–11 pp. 335–337. Sacramento, Calif, 1934.

In America, the alfalfa weevil [*Hypera variabilis*, Hbst.] was first observed in Utah in 1903 or 1904 and now occurs in 106 counties in 7 of the western States wherever lucerne is grown, regardless of altitude and local climate. It has spread consistently at the rate of about 10–20 miles annually, chiefly by flight, but also by being carried along irrigation canals and by the agency of man. Quarantine regulations appear to be ineffective and have tended only to interfere with normal movement of produce, particularly in the hay industry, and to create public feeling against quarantines in general. The author thinks that a comparison of the cost and inconvenience of observing the regulations with the damage done by the weevil shows that its economic importance is considerably overestimated. It is not a serious pest where proper methods of cutting and handling hay are observed and parasites have begun their work.

Coppel Rivas (E.). **Fruit Fly Situation in Mexico.**—*Mon. Bull. Calif. Dep. Agric.* **23** no. 10–11 pp. 337–338. Sacramento, Calif, 1934.

As a result of control measures following the destruction of fruit trees, the larvae of *Anastrepha* are now rare in Morelos, which was originally one of the most severely infested parts of Mexico. A recent regulation prohibits the transport of all host fruits of *Anastrepha*

striata, Schin., *A. fraterculus*, Wied., and *A. serpentina*, Wied., in and from a certain area Since the larvae cannot survive in fruit sterilised at 110°F. [*cf. R.A.E.*, A **20** 571], sterilising plants are to be established in various fruit-growing areas. The compulsory treatment of fruits moving from infested areas will prevent the spread of the fly to regions near the Texas border, whence it has reached the United States.

EDWARDS (W. H.). **Two Weevils whose Larvae attack the Roots of *Citrus* Plants in Jamaica.**—*J. Jamaica agric. Soc.* **38** no. 11 pp. 678–680, 1 fig. Kingston, November 1934.

The adults of *Prepodes vittatus*, L., and *Pachnaeus litus*, Germ., feed on the leaves, flowers and the epidermis of young fruits of *Citrus* in Jamaica, but the larvae cause greater damage by attacking the bark of the roots and stems of young plants just below the surface of the soil. When numerous they girdle the main roots, causing the sap to stop flowing and the leaves to wilt. Young plants may be killed in a short time or dwarfed ; older plants are more resistant, but do not grow well or give a good yield. Control measures consist of hand collection and destruction of the adults during the first 5 months of the year, shaking the weevils from the trees on to a large piece of cloth, fumigation of the soil round infested plants with calcium cyanide ($1\frac{1}{2}$–$2\frac{1}{2}$ oz. cyanogas per tree), or the application of paradichlorobenzene as a repellent where adults are most numerous. The surface of the soil round the base of the tree should be removed and 1 oz. paradichlorobenzene spread in a continuous band at a distance of 8 ins. from the trunk ; a layer of soil about 4 ins. thick should then be placed over it and packed firmly.

GOLDSCHMIDT (R.). *Lymantria. — Bibliogr. genet.* **11** pp. 1–186, 1 map, 75 figs., 5 pp. refs. 's-Gravenhage, 1934.

This review, which concludes the author's work over a period of 25 years, contains analyses of intersexuality and geographical variation in *Porthetria* (*Lymantria*) *dispar*, L., and short notes on the cytology, etc., of *L. monacha*, L.

ZWÖLFER (W.). **Die Temperaturabhängigkeit der Entwicklung der Nonne (*Lymantria monacha* L.) und ihre bevölkerungswissenschaftliche Auswertung.** [The Dependence on Temperature of the Development of the Nun Moth and its scientific Application to Population Studies.]—*Z. angew. Ent.* **21** no. 3 pp. 333–384, 15 graphs, 3 maps, 47 refs. Berlin, November 1934.

In continuation of work on the effect of temperature and relative humidity on *Lymantria monacha*, L. [*R.A.E.*, A **21** 388], an attempt was made to apply the results of further experiments on the time of development of the various stages in relation to population studies. Special attention was given to the regional distribution of the moth, the numerous records of which in Europe have been collated by Wilke [**19** 510]. Since the experimental results were in satisfactory agreement with those observed in nature, the author thinks that they may be used to ascertain its little known Asiatic distribution.

The technique of the experiments is described. The hyperbolic function derived from a calculation of the thermal constant in day-degrees was used as the most convenient way of correlating individual results in a study of temperature and development, but the author regards mathematical formulae as merely an aid in biological studies. As the nun moth hibernates in the egg stage with a completely developed embryo, the results, which are tabulated, begin with the hatching period in spring and, passing through the 6 larval instars and pupal stage, end with embryonic development in the egg in autumn. The thermal constants and (in brackets) thresholds of development in degrees centigrade for each of these stages respectively were 65 (4·9), 217 (3·2), 84 (5·7), 84 (7·2), 90 (7·6), 132 (7·8), 197 (6), 130 (8·4) and 240 (6·8). The larvae, which were fed exclusively on spruce, and the pupae had been subject to uniform pre-experimental conditions. In supplementary feeding experiments with first-instar larvae no difference in duration of development was observed with spruce, pine or beech, but there was a slight retardation with larch.

The curve representing the lowest mortality of the eggs at different temperatures according to empirical data roughly corresponded with that representing the hatching of the eggs according to calculations from the thermal constant in day-degrees. The zone of least mortality, however, at 100 per cent. humidity, lay between about 10 and 17°C. [50 and 62·6°F.], whereas the zone of quickest development lay between 20 and 30°C. [68 and 86°F.]. The egg during its hatching period was very dependent on humidity. Hatching was most rapid with a saturated atmosphere. Within a range of 40–100 per cent., humidity had no great influence on the larvae of the first and second instars. Prolonged low temperatures before the beginning of the experiments greatly increased the readiness to hatch in hibernated eggs.

The shortest time of total development from the hatching of the egg to the emergence of the adult was 49 days, and occurred at about 28°C. [82·4°F.]. The thermal constant of total development, obtained by adding the thermal constants of each stage, was 1240 ± 40 day-degrees C. [2232 ± 72 F.]

The stages up to the fourth larval instar are the easiest to control. Their appearance can be calculated according to the experimental data, using the average monthly temperatures as a basis. An example comparing theoretical data with observations in nature in Germany is given. A " nun moth temperature index " is established for any given locality by dividing the sum of monthly temperature indices for the months in which development occurs by the thermal constant of total development. The monthly indices are obtained by subtracting the threshold of development from the average monthly temperature and multiplying the remainder by the number of days in that month during which any particular stage of the moth occurs. If the nun moth temperature index is equal to or more than 1, then the existence of *L. monacha* is theoretically possible. If it is less than 1, the total temperatures in the locality are insufficient to ensure the development of a complete generation. By means of this index the author has drawn maps showing the world distribution of *L. monacha*, which are in substantial agreement with observations recorded in nature. The typical nun moth regions have a temperature index of 1·1–1·4. The index of a " year of preparation " preceding an outbreak appears to be 1·3.

Henze (O.). **Ueber die Wirkung strömender Luft auf die Entwicklung von Lepidopteren.** [On the Effect of Air in Motion on the Development of Lepidoptera.]—*Z. angew. Ent.* **21** no. 3 pp. 385–405, 3 graphs, 10 refs. Berlin, November 1934.

In his study of weather and climate in relation to insects [*R.A.E.*, A **18** 228], Uvarov drew attention to the importance of wind as a factor influencing evaporation, and in view of this the author made experiments in Munich on the physiological effect of wind on all stages of *Porthetria dispar*, L., *Lymantria* (*Liparis*) *monacha*, L., and *Malacosoma* (*Bombyx*) *neustria*, L. A multiple hygrostat and an electric fan were used, and the stream of air, under conditions comparable to natural temperatures and air-humidities, was regulated to correspond to wind speeds in nature.

The following is taken from the author's summary: The effect of wind was evident chiefly in the duration of the larval stage, which became longer as the wind speed increased. Examination of the weight and number of the larval excreta and of the weight of the pupae showed that destructive metabolism increased and constructive metabolism decreased with the wind speed. Larval mortality and the course of infection by disease were not influenced, nor was any effect observed on the pupal, adult and egg stages. There was no difference in the responses of the three species tested.

Smirnov (E.) & Polejaeff (W.). **Kampf um den Raum bei der Schildlaus *Lepidosaphes ulmi* L.** [Competition for Space by the Coccid, *L. ulmi*.]—*Z. angew. Ent.* **21** no. 3 pp. 406–414, 15 figs. Berlin, November 1934.

In a previous paper a decrease of fecundity of *Lepidosaphes ulmi*, L., accompanying an increase of infestation was stated to be due to an increase in the percentage of sterile scales [*R.A.E.*, A **22** 374]. In this paper cases observed at Moscow are described and figured, showing that overcrowding causes deformations of the shields and may also detach the scales from their bases so that they die from starvation.

Dingler (M.). **Ueber unsere beiden Spargelkäfer (*Crioceris duodecimpunctata* L. and *Cr. asparagi* L.).** [On our two Asparagus Beetles.] —*Z. angew. Ent.* **21** no. 3 pp. 415–442, 29 figs., 20 refs. Berlin, November 1934.

The adults and particularly the larvae of *Crioceris duodecimpunctata*, L., and *C. asparagi*, L., strip the green shoots of asparagus in Germany. Plants that are one year old are most severely attacked. Notes are given on the distribution of these species, together with detailed descriptions of their morphology, anatomy and biology taken from the literature and the author's own observations in Germany.

The overwintered adults of *C. asparagi* appeared at the end of April and were more numerous than those of *C. duodecimpunctata* up to the end of July, except for a month beginning about 20th May. They appeared earlier, fed and reproduced more rapidly, survived longer and required less warmth. The females began ovipositing immediately, whereas those of *C. duodecimpunctata* delayed for about a month. In both species there appeared to be two generations a year, and the longevity of the adults depended less on food than on water. Some that had overwintered lived for 23 days without food and water, and

40 days without food. *C. asparagi* appeared to resist dryness better than *C. duodecimpunctata*. The length of the egg stage was probably the same for both species ; in cool weather in May eggs of *C. asparagi* hatched in 10–12 days. Pupation took place in the ground. On 25th September 1930 half-grown larvae as well as adults and mature larvae of *C. asparagi* were noticed, so that the pupae may overwinter as well as the adults.

Puzanowa (E. W.). *Asphondylia prunorum* **Wachtl (Diptera, Cecidomyidae) und deren Pilzgallen am Pflaumenbaum.** [*A. prunorum* and its Fungus Galls on Plum Trees.]—*Z. angew Ent.* **21** no. 3 pp. 443–462, 16 figs., 30 refs. Berlin, November 1934.

General notes on the cultivation of fungi by insects and on fungus galls produced by Cecidomyiids are followed by a description of the galls on *Prunus instititia* and *P. spinosa* caused by *Asphondylia prunorum*, Wachtl, and of its biology, based on material collected in Russia in 1932 and 1933. The fungus spores are introduced when the eggs are laid in the fruit buds, and the mycelium develops inside the gall. When the adult gall-midge emerges at the end of June or the beginning of July, the fungus appears through the exit-hole. The fruit crop is often considerably reduced. Three Chalcidoid parasites were observed.

Schönwiese (F.). **Beobachtungen und Versuche anlässlich einer Uebervermehrung von *Lophyrus sertifer* Geoffr. (*rufus* Panz.) in Südkärnten in den Jahren 1931–1932.** [Observations and Experiments relating to an Outbreak of *Diprion sertifer*, Geoffr., in South Carinthia in 1931–32.]—*Z. angew. Ent.* **21** no. 3 pp. 463–500, 19 figs., 31 refs. Berlin, November 1934.

In 1931–32 an outbreak of *Diprion* (*Lophyrus*) *sertifer*, Geoffr. (the first recorded in Austria) occurred on pines in South Carinthia at an altitude of about 1,600 ft. Polewoods 20–30 years old were preferred. References to the literature and European records from 1833 to 1926 are given, and all the immature stages are described. There was one generation a year, and the winter was normally passed in the egg stage. The larvae hatched in May ; the males moulted 5 times and the females 6. The mature larvae entered the ground and spun cocoons in which they later pupated. The adults emerged and oviposited at the end of September. As a rule about 10 per cent. of the larvae remained in their cocoons for a full year. The eggs were very susceptible to the drying out of the pine needles, so that stands in which the needles had a low moisture content were less severely damaged. The optimum temperature for embryonic development was between 2 and 22°C. [35·6–71·6°F.]. Eggs that had not been exposed to outdoor winter conditions failed to develop further.

The larvae fed on the needles of the two preceding years, and not on the current year's May shoots. In the last instar they sometimes fed on the bark. The damage they cause is severe enough to reduce growth and encourage secondary pests.

Observations indicated that if a residual infestation is considerable, fine weather in May and June for a few consecutive years may occasion an outbreak, but that the usual weather in Carinthia in these months, while it does not appear to influence an outbreak that has just started,

can terminate one that has already progressed far. The first three larval instars are particularly susceptible to weather, and the period 1st-20th May may be regarded as the critical period in development.

All the parasites observed attacked the larvae in the spinning stage or were bred from the cocoons. The most important were *Exenterus cingulatorius*, Holmgr. (representing 55 per cent. of the total parasites), *Spilocryptus nubeculatus*, Grav. (25 per cent.), and *E. oriolus*, Htg. (17 per cent.). While weather conditions were mainly responsible for checking the outbreak of *D. sertifer* in 1932, these three parasites were also valuable. In the Schiefling district in the autumn of 1931, 49 per cent. of the cocoons were parasitised, 7 per cent. were infected by fungi, and 2 per cent. had been otherwise destroyed. In the autumn of 1932, the percentages were 89, 6, and 3 in the Schiefling district, and 75, 7, and 2 in the Ruden district. The flight and oviposition periods of *E. cingulatorius*, all stages of which are described, coincided with the spinning stage of *D. sertifer*. In thermostat experiments temperatures of from −2 to −20°C. [28·4 to −4°F.] had no effect on the cocooned larvae of *D. sertifer* or on the parasites. At temperatures of 2, 12 and 21°C. [35·6, 53·6 and 69·8°F.] both the larvae and the parasites remained alive, but at 33 and 39°C. [91·4 and 102·2°F.] both died in a few days, the parasites dying first. *S. nubeculatus*, the egg and larva of which are described, oviposited on the host within its cocoon from June to September. It may be an occasional hyperparasite, as young larvae and eggs were found on larvae of *Exenterus*.

Torocampus eques, Htg., and its variety *aterrima*, Fahringer, each comprised 1 per cent. of the total number of parasites.

Hemiteles castaneus, Tasch. var., and *H. inimicus*, Grav., were hyperparasites attacking *Exenterus*. Other parasites bred from the cocoons of *D. sertifer* were *Lophyroplectus luteator*, Thnb., *Microcryptus basizonus*, Grav., *Pseudotorymus obsoletus*, Spin., *Microplectron fuscipennis*, Zett., and *Meteorus lophyriphagus*, Fahringer sp. n. (descriptions of the last two by Fahringer being given) and the Tachinid, *Phryxe vulgaris*, Fall. *Entedon ovulorum*, Ratz., was obtained from the eggs of *D. sertifer* near Vienna, but was not seen in Carinthia.

Balachowsky (A.). **Sur les dégâts occasionnées en France par *Blastodacna atra* Haw. destructeur des bourgeons de pommier.**— *Rev. franç. Ent.* **1** fasc. 3 pp. 208–211, 1 fig., 7 refs. Paris, 1934.

During 1934 the first reports of injury by the larvae of *Chrysoclista* (*Blastodacna*) *atra*, Haw., to apple buds in France, where it has long been established [*cf. R.A.E.*, A **21** 427], were received from widely separated localities in the greater part of the country. Injury was particularly severe in the Auvergne region and the neighbourhood of Lille, whereas near Paris the attacks were slight and limited to a few shoots. Observations of the life-history generally confirm those recorded from England [*R.A.E.*, A **19** 135], though in France adults emerge from 6th to 23rd June, and the larvae are smaller. The larvae hatch in about a week and mine into the newly-formed buds at the base. Development continues slowly throughout the rest of the summer and autumn, and it stops almost completely in winter to begin again actively early in spring. With the first warm days the larvae develop rapidly and many buds are destroyed before they open. The soft parts are eaten out, but the outer scales are untouched. The mines are also often grouped around the junction of the buds with

the stem, in which case the buds open but the bunch of leaves soon withers. Fruit buds are preferred. Pupation takes place in the shoot, generally at its extremity.

The larval parasite, *Copidosoma woroniekae*, Nowicki, was bred from 50 per cent. of the material received from Puy-de-Dôme, and the adult Encyrtids emerged between 19th and 23rd June. Owing to the sheltered position of the larvae and pupae, no practical methods of controlling *C. atra* can be applied, but it is thought that it is usually kept in check by its numerous parasites.

BERLAND (L.). **Notes biologiques.**—*Rev. franç. Ent.* **1** fasc. 3 p. 215. Paris, 1934.

Cephalonomia hypobori, Kieff., a parasite of the Scolytid, *Hypoborus ficus*, Er., originally described from Montpellier, has been discovered in Morocco under similar conditions. It is very probable that this Bethylid is present throughout the Mediterranean region wherever fig trees are attacked by *H. ficus*. It may, however, attack other Scolytids, as it has been taken in Algeria in mines of *Pityophthorus glabratus mauretanica*, Peyerim., in the branches of conifers.

DENIS (J. R.). **Un Collembole nouveau recolté en grand nombre dans une maison.**—*Rev. franç. Ent.* **1** fasc. 3 p. 212. Paris, 1934.

LESNE (P.). **L'***Entomobrya subpurpurascens* **Denis hôte adventice d'une maison.**—*T.c.* p. 218.

Entomobrya subpurpurascens, sp. n., described in the first paper, is recorded in the second from Neuilly-sur-Seine, as occurring in two fourth-floor flats that had been added to an older structure during the preceding year. At the end of May the Collembola were observed breeding on the floors along the walls, the foci of infestation being apparently under the skirting board or in cavities beneath the parquet flooring. It is supposed that they were introduced into the house with building materials when the additional storey was constructed, and probably originally came from household rubbish.

PUSSARD (R.). **Note préliminaire sur les méthodes de lutte contre le bupreste des arbres fruitiers,** *Capnodis tenebrionis* **L.**—*C. R. Acad. Agric. Fr.* **20** no. 31 pp. 1010–1019, 3 refs. Paris, December 1934.

Information obtained in further studies on the biology of *Capnodis tenebrionis*, L., on stone-fruit trees in France [*cf. R.A.E.*, A **22** 714] is briefly summarised and preliminary observations on control measures are recorded. Males and females are present in about equal numbers [*cf.* **19** 625]. The young larvae, which together with the eggs, are attacked by ants, find difficulty in entering young trees that are well established in deep moist ground and secrete much gum [*cf.* **22** 715]. The larvae move through the soil from root to root or from tree to tree.

Laboratory experiments made with insecticides other than arsenicals showed that barium fluosilicate dust killed all the adults in 4 days when it was used alone or mixed with 50 per cent. talc, and in 5–6 days when it was mixed with 80 per cent. talc. The latter mixture remained on the plant for 15 days during dry weather in the south of France. Mechanical obstacles to oviposition were ineffective. The eggs of *C.*

tenebrionis were rapidly killed by the application, particularly immediately after oviposition, of a mixture of 1 lb. white soap, 1·6 oz. sodium carbonate, 2·4 oz. nicotine sulphate and 10 gals. water. Eggs subjected 5 days after they had been laid to fumigation with hydrocyanic acid gas for 2 hours at a temperature of 26–30°C. [78·8–86°F.], using pure sodium cyanide at the rate of 18 oz. with 27 fl. oz. sulphuric acid and 36 fl. oz. water per 1,000 cu. ft., hatched normally 30 days later, and both larvae and adults resisted an hour's fumigation under the same conditions. Mature larvae were killed within an hour when they were drenched with a solution of 1 lb. soap, 2·4 oz. nicotine sulphate, 0·1 fl. oz. spreader and 10 gals. water. The roots of infested nursery trees were dipped in a strong emulsion of mineral oil containing dichlorobenzene, and in a solution of nicotine sulphate with a spreader, but neither penetrated sufficiently to kill the larvae in their mines. Active products such as the vapours of carbon bisulphide and chloropicrin were found to be more rapidly toxic to the trees than to the larvae.

In an experiment on 4th August 1933, two plum trees were enclosed in large cages, and the trunk of one was painted 16 ins. above the base and 4 ins. below the soil surface with an emulsion containing 2 per cent. oil by volume and 20 per cent. barium fluosilicate by weight. A few hours later, 3 males and 7 females of *Capnodis* were released in each cage. On 14th May, 15 larvae were found on the untreated tree, but neither larvae nor mines on the other. In addition to painting the trunks from June to September with such an emulsion, and dusting with talc and barium fluosilicate, the usual measures for control [*cf.* **19** 625] are recommended.

Smit (B.). **A Study of the most important Insect Pests that confront the *Citrus* Grower in the Eastern Province.**—*S. Afr. J. Sci.* **31** pp. 439–441. Johannesburg, November 1934.

In the valleys of eastern Cape Province, *Aphis tavaresi*, Del G., is common on all well grown *Citrus* trees in spring and does much damage to the flower buds and young fruits. A 2 per cent. dust of nicotine sulphate and lime has given very good results, particularly in early spring when control is most important. It is easily applied and may be used while the groves are still wet from irrigation. Numerous contact insecticides, including the latex of *Euphorbia*, proved inferior to it. *Ceratitis capitata*, Wied., punctures ripening oranges in autumn and, though few of the eggs apparently develop, large numbers of the fruits decay [*cf. R.A.E.*, A **23** 25]. A bait-spray of sodium fluosilicate and sugar [*cf.* **22** 353] has proved effective in extensive trials and does not affect the flavour of the fruit [*cf.* **19** 707]. In certain areas *Pseudococcus citri*, Risso, is a serious pest, chiefly of navel oranges and grape fruit. Bands are only effective against the Argentine ant [*Iridomyrmex humilis*, Mayr] or *Anoplolepis* (*Plagiolepes*) *custodiens*, Fr. Smith [*cf.* **21** 277] on trees with fairly long trunks and branches that do not touch the ground. The control of these ants enables *Cryptolaemus* [*montrouzieri*, Muls.] to destroy the mealybug; moreover, the encouragement afforded to indigenous predators may render the breeding of this Coccinellid unnecessary. *Scirtothrips aurantii*, Faure, attacks *Citrus* soon after blossoming, and causes unsightly areas on the fruit. Promising results have been obtained with dusts of pure sulphur, which are easier and quicker to apply than lime-sulphur sprays [*cf.* **22** 80].

Smit (B.). **The Fumigation of *Citrus* Trees in the Eastern Cape Province.**—*S. Afr. J. Sci.* **31** pp. 442–461, 2 figs., 5 refs. Johannesburg, November 1934.

A detailed account is given of extensive experiments carried out in various districts in eastern Cape Province in 1931–33 on the fumigation of *Citrus* against *Aonidiella aurantii*, Mask., with hydrocyanic acid gas liberated by means of cyanogas or calcid calcium cyanide [*R.A.E.*, A **20** 671]. Both dusts gave good results and proved harmless to the trees. Their employment on a commercial scale in 1933–34 showed that they are easier to use than older methods, that the system of dosing is accurate, particularly with calcid, and that they are effective in control.

Le Pelley (R. H.). **Report on Questionnaire on *Antestia* Control 1933–34.**—*Bull. Dep. Agric. Kenya* no. 5 of 1934, 34 pp., 7 refs. Nairobi, 1934.

This is a report on the incidence of *Antestia* on coffee in Kenya in 1933 and part of 1934, together with a survey of the methods used for its control, compiled from information supplied by planters in answer to a questionnaire. Replies from two-thirds of the coffee-growing areas reported no infestation in 230 cases, slight attack in 132, moderate in 70 and heavy in 70. For control, hand-picking was employed in 18 instances, bait sprays in 91 and pyrethrum extract in 53; the cost of each method is estimated. Though 67 million individuals were collected by hand, the pest continued to increase. Experiments confirmed the fact that this method is almost entirely valueless. Bait sprays of sodium arsenite (either of two formulae [*R.A.E.*, A **17** 626; **23** 70] being equally good), are cheap and of considerable value, but are not invariably effective. Hymenopterous parasites feed on the baits, and the result may be that the leaf-miner [*Leucoptera coffeella*, Guér.] increases in numbers [*cf.* **23** 70]; three consecutive applications should be the maximum. Kerosene extract of pyrethrum [**21** 265; etc.], the strength and volume of which can be increased if it is not satisfactory at the standard rate, gave the highest proportion of satisfactory results, and if carefully applied, it may be considered a certain control well worth its higher cost. The spray does not seem to affect Hymenopterous parasites, as they are mostly protected in the tunnels of leaf-miners or inside the eggs of *Antestia* or the bodies of Coccids, but its action on Coccinellids might occasionally cause an increase in the numbers of the mealybug [*Pseudococcus lilacinus*, Ckll.] [*cf.* **21** 266]. Successful results have been reported with pyrethrum-oil sprays emulsified in water [*cf.* **21** 303], but owing to their cost they are not widely used. Leaving unpruned trees that bear a crop and spraying them periodically might be of considerable value. Various unimportant minor practices are discussed, including the collection of eggs for the liberation of parasites, which is considered worthless. *Psychotria nigropunctata* is an alternative food-plant in one district, and the importance of a study of indigenous food-plants is emphasised.

Brief notes are given on 27 replies received from Uganda, where *Coffea robusta* seems to be immune from attack. The author suggests that the routine method of spraying different blocks of trees with

pyrethrum extract to determine the amount of infestation and the need for control [see next paper] would prove valuable in both Kenya and Uganda.

Le Pelley (R. H.). **Pyrethrum-extract Spraying for the Control of *Antestia* on Coffee, with Suggestions for Routine Testing on Plantations.**—*Bull. Dep. Agric. Kenya* no. 8 of 1934, 15 pp., 2 refs. Nairobi, 1934.

Further details are given on the method of routine testing to ascertain the incidence of *Antestia* on coffee in Kenya [*cf. R.A.E.*, A **21** 34]. The following is largely taken from the author's summary: The severity of attack in blocks of 2½–5 acres is calculated from the average numbers of bugs obtained on 10 trees selected at random and sprayed with kerosene extract of pyrethrum under a cover of calico. Tests should be made every month when an average of less than 2 individuals is found to a tree, or when 10 trees in each block of 10 acres are uninfested; they should be made fortnightly when there are 4 individuals or less, and weekly when there are 6 or more or when a block is adjacent to one containing this number, however slightly it is itself infested. Control measures are essential when the average number on any tree reaches 6, and the weekly tests should be repeated four times. The value of routine testing lies in determining the intensity of attack in different parts of a plantation and the areas in which treatment is justified, independently of the method employed. Tests made before and after the application of control measures will determine their value.

In the second part of the paper recommendations are given for the control of *Antestia* by sprays of kerosene-pyrethrum extract and details of the results obtained in some plantations are quoted. After spraying, the bugs should be collected from the ground, since a small proportion of them might recover.

Jack (R. W.). **The Destruction and Control of Locust Hoppers.**—*Rhod. agric. J.* **31** no. 12 pp. 856–864, 2 pls.; also as *Bull. Minist. Agric.* [*S. Rhodesia*] no. 938, 9 pp., 2 pls. Salisbury, December 1934.

Brief instructions are given on the use of the commonly accepted methods for the control of locust hoppers. Baits, when used against the red locust [*Nomadacris septemfasciata*, Serv.] in Southern Rhodesia, have not proved reliable under all conditions. Special notes on the danger of arsenical poisons to animals and on the antidotes to be applied in cases of poisoning are appended.

Squire (F. A.). **Report of the Entomological Division for the Year 1933.**—*Div. Rep. Dep. Agric. Brit. Guiana 1933* pp. 125–128. Georgetown, 1934.

Dynastids caused considerable damage to sugar-cane in British Guiana in 1933, although no serious outbreaks occurred. *Dyscinetus geminatus*, F. [*R.A.E.*, A **21** 615] was scarce, probably because the larvae were killed as a result of abnormally heavy rains that fell throughout the year, particularly during the dry season (February–April) when the larvae are most abundant. Injury by the adults of *D. bidentatus*, Burm. [*loc. cit.*] caused some fields to be abandoned in May. Natural enemies, which include the Asilid, *Mallophora calidus*,

F., are considered of little value, as the Dynastids occur at a depth of 6–36 ins. in heavy clay soil. The grubs are numerous in soils rich in organic matter and of suitable moisture, and breeding commonly occurs in the humus round the edges of ponds. *Sipha flava*, Forbes, caused considerable loss to sugar-cane, severe outbreaks occurring during the rains on first ratoons in some localities. The Aphids are apparently affected by sunlight; plants kept out of direct sunlight showed signs of infestation after several days, but became free again when they were exposed for a few days. Moreover, plants weak in chlorophyll appear to be more readily attacked. No sexual forms have been found, and it appears that the species is perpetuated by parthenogenetic females, among which alate forms usually develop on crowded leaves. Where attack on plants only a few months old was severe and unevenly distributed, a spray of nicotine sulphate and soap with molasses as an adhesive was found effective. Stripping infested leaves from the plants only weakens them further and does not limit the Aphid population. Conditions that favour the Aphids are adverse to Coccinellids, and the author considers that the importance of the latter in controlling infestations has been overestimated. Several outbreaks of *Laphygma* sp. occurred in different parts of the Colony, causing considerable damage to young sugar-cane and pastures.

The Lycaenid, *Tmolus echion*, Butl., attacked a few pineapple fruits at Dalgin, feeding on the corolla as it appeared through the sepals and burrowing through the receptacle into the young fruit. *Athaumastus laetus*, Mayr, is common on pineapples in the coastlands. *Brassolis sophorae*, L. [*cf.* **23** 60] was the principal pest of coconuts. *Strategus aloeus*, F., may be dug out of its burrows in young coconut trees, but the use of calcium carbide [**22** 326] is quicker and less likely to injure the roots.

Mesnil (L.). **Note préliminaire sur un nouveau parasite des céréales *Phytophaga mimeuri* sp. n.**—*Bull. Soc. ent. Fr.* **39** no. 17 pp. 245–247, 3 refs. Paris, 1934.

A Cecidomyiid of the genus *Mayetiola* (*Phytophaga*) which causes serious injury to wheat, barley and rye in Morocco and Algeria and has long been known as *M. destructor*, Say, has now been discovered to be a distinct species, and is described as *M.* (*P.*) *mimeuri*, sp. n. The characters distinguishing it in its various stages from *M. avenae*, Marchal, which is widely distributed on oats in France and Italy, and *M. destructor* are briefly indicated. The two latter species produce only a slight depression on the plants they attack, but the larva of *M. mimeuri* forms a true gall, in which it is almost completely buried. The distended cells can be plainly seen through a magnifying glass in the part of the plant adjacent to the larva or pupa.

Priesner (H.) & Hosny (M.). **Contributions to a Knowledge of the White Flies (Aleurodidae) of Egypt (III).**—*Bull. Minist. Agric. Egypt* no. 145, 11 pp., 10 pls. Cairo, 1934. Price *P.T.* 5.

In continuation of studies on the Aleurodids of Egypt [*cf. R.A.E.*, A **22** 710], descriptions are given of all stages of *Aleurolobus niloticus*, sp. n., and of the pupal case and both sexes of the adult of *Aleurotrachelus citri*, sp. n., from various food-plants, and of the pupal cases of *Dialeurodoides afer*, sp. n., from *Lawsonia alba* and *Ficus sycomorus*,

A. alhagii, sp. n., from several leguminous plants, and *Dialeurodes elbaënsis*, sp. n., from *Ficus salicifolia*. *Balanites aegyptiaca* may be defoliated when *Aleurolobus niloticus* occurs on it in association with *Meguegynothrips efflatouni*, Priesn., but it is thought that the thrips may be mainly responsible. *Encarsia elegans*, Masi, previously known only in Italy, was bred from pupal cases of this Aleurodid on *Zizyphus spina christi* in March 1932, and is probably the most important parasite. Aphelinids of the genus *Eretmocerus* were bred from *Aleurobus, D. afer* and *Aleurotrachelus citri*. *A. citri* is widely distributed on *Citrus*, but is generally of little importance in Middle and Lower Egypt, though its presence in great numbers has caused leaf drop in neglected orchards in Upper Egypt. Its uneven distribution appears to be due to climatic conditions rather than to parasites. *Siphoninus granati*, Priesn. & Hosny [**20** 620] is recorded from pear, apple and pomegranate (*Punica granatum*).

Cherian (M. C.). **Note on a Pyralid (*Argyria fuscivenalis* Hmp.), Caterpillar Pest of *Crataeva religiosa* Forst.**—*J. Bombay nat. Hist. Soc.* **37** no. 3 pp. 694–696, 1 pl. Bombay, 15th December 1934.

The stages of the Pyralid, *Argyria fuscivenalis*, Hmpsn., which is a serious pest of the ornamental tree, *Crataeva religiosa*, in Coimbatore and its vicinity, are very briefly described. The egg, larval and pupal stages last 3–4, 12–13 and 9–10 days, respectively. The larvae feed on the leaves under webs and pupate in silken cocoons. The adults, which live for an average of 12 days, prefer to oviposit on infested leaves bearing webs. The larvae are parasitised by *Apanteles creatonoti*, Vier., *Heterogamus* sp., and an Ichneumonid, but these are not important in control. Good results have been obtained with a spray of ½ oz. lead arsenate in 1 gal. water.

Misra (M. P.) & Gupta (S. N.). **The Biology of *Holcocera pulverea* Meyr. (Blastobasidae), its Predators, Parasites and Control.**—*Indian J. agric. Sci.* **4** pt. 5 pp. 832–864, 1 pl., 4 figs., 20 refs. Delhi, October 1934.

This is a detailed account of studies covering six years, made at Nankum, on the biology and control of *Holcocera pulverea*, Meyr., the larvae of which are predacious on *Laccifer* (*Tachardia*) *lacca*, Kerr. All stages are described, the larval instars, of which there are 5 in generations occurring from July to October and 9 in those between November and June, being dealt with in great detail. The length of the egg stage varies from 1–6 days. The newly hatched larva enters the lac incrustation and feeds on the lac insects and their tests from below, and also devours dead lac insects and resin. The larva of *H. pulverea*, unlike that of *Eublemma amabilis*, Moore, destroys many more lac cells and lac insects than are necessary for its maintenance. An individual larva is capable of devouring 7–45 mature lac females or 60–450 immature lac cells. When mature the larva spins a cocoon in its gallery, where pupation occurs within 2 days during the warmer months and 10 days during the colder ones. The monthly average pupal period varied from 7·3 to 13·5 days in the male and from 7·5 to 13 in the female. The maximum and minimum periods for both were 18 days in October and 5 days in July, respectively.

Under laboratory conditions the maximum life of an adult female was 42 days in December and the minimum 1 day in the period March to October. The female generally lives a little longer than the male, but the male lives longer in cold weather. Pairing was not observed and probably takes place only at night. Eggs were laid in the laboratory only in cages provided with lac sticks. Both in field and laboratory, the eggs were laid singly between the cells or in the anal openings of the female lac tests, or in the empty tests of the male lac insects through the opercular hole. They have also been found on the uncovered parts of the lac-bearing branches, or more often where they were covered with black fungus. The preoviposition period varied from 1 to 24 days, with an average of 6·6 over the whole year, and the duration of oviposition from 1 to 20 days, with an average of 4. Females laid up to 142 eggs, the average being 20.

The length of the life-cycle varies from 33 days for males and 32 days for females resulting from eggs laid in June to 198 days for males and 214 days for females resulting from eggs laid in September, when some individuals go into hibernation. Calculations based on the estimated life-cycle periods and confirmed by results obtained from breeding lineal generations in the laboratory indicate that *H. pulverea* has on an average only 5 generations a year and not 6 as hitherto believed. In the third, fourth and part of the fifth generations it develops from April to July–August under very adverse conditions. Its distribution, economic status and prevalence in the different crops of lac are discussed. Although in the field it is not so injurious to fresh lac as *E. amabilis*, it is more destructive to stored lac.

Natural enemies have already been noticed [**19** 26, 650; **21** 131; **23** 87]. Control measures apart from fumigation and water immersion, which are not dealt with, include the prompt scraping of the entire crop with the exception of the portion required for brood; the use of a brood as far as possible free from parasites and predators; the removal from the trees of brood lac as soon as they have received proper infection; and the avoidance for the winter crop of the use of trees on which the lac matures late and so exposes the subsequent crop to infection.

Cummins (J. E.) & Wilson (H. B.). **The Pore Size (Vessel Diameter) of some Australian Timbers and their Susceptibility to Attack by the Powder Post Borer** (*Lyctus brunneus* **Stephens).**—*J. Coun. sci. industr. Res. Aust.* **7** no. 4 pp. 225–233, 1 fig., 9 refs. Melbourne, November 1934.

An investigation has been conducted in Australia primarily to determine the applicability to Australian timbers of S. H. Clarke's conclusions on the relation between vessel size and attack by *Lyctus* [*R.A.E.*, A **16** 586]. The largest minimum pore diameters of 94 species of Australian timbers from which infestation by *Lyctus* has been recorded range from 104 μ to over 300 μ, and normal eggs of *Lyctus brunneus*, Steph., from 110 μ to 163μ. Since severe attack occurs in species of timber in which the largest pores (occurring sometimes in a low proportion) have a minimum diameter less than that of the smallest egg, the relation between the diameters of the pores and the egg cannot be the only factor limiting infestation. A more satisfactory explanation has been given by E. A. Parkin [**22** 545], but the pore size that limits infestation in Australia is somewhat larger

than the actual dimensions of the ovipositor recorded by him. In Australia the sapwood of timbers with pore sizes below 90 μ may be considered immune from attack, but no important commercial hardwoods come within this category.

Andrewartha (H. G.) & Steele (H. V.). **Thrips Investigation. 4. Some Observations on the Fluctuations in the Numbers of** *Thrips imaginis* **Bagnall in the Vicinity of Melbourne during the Period 1932 to 1934.**—*J. Coun. sci. industr. Res. Aust.* **7** no. 4 pp. 234–238, 4 figs., 3 refs. Melbourne, November 1934.

In connection with studies of the seasonal abundance of *Thrips imaginis*, Bagn., in the neighbourhood of Adelaide [*R.A.E.*, A **22** 448, etc.], fluctuations in its numbers in Victoria between September 1932 and July 1934 are recorded. Low soil moisture in the preceding autumn, which reduced the population developing in the following spring, is among the most important meteorological factor influencing these fluctuations. In both years under review relatively high numbers were recorded in early summer, but were greatly reduced during late summer and early autumn ; for the greater part of these two seasons the ratio of rainfall to evaporation from free water, which is shown in graphs in relation to thrips abundance, was below 0·5. The activity of the overwintering adults of *T. imaginis*, believed to be the main source of supply for the spring generation in Victoria, is chiefly conditioned by temperature. As the adults become very sluggish at temperatures below 59°F., they remain inactive at the winter temperatures prevailing round Melbourne and only reproduce when temperatures rise in the spring. This supply of overwintering adults was relatively large in the spring of 1932 when adequate soil moisture was probably maintained from the middle of February onwards, and very low in 1933 when the ratio of rainfall to evaporation remained consistently below 0·5 until 15th April, thus allowing only a short period during which soil moisture was favourable before winter set in.

Andrewartha (H. G.). **Thrips Investigation. 5. On the Effect of Soil Moisture on the Viability of the Pupal Stages of** *Thrips imaginis* **Bagnall.**—*J. Coun. sci. industr. Res. Aust.* **7** no. 4 pp. 239–244, 1 fig., 4 refs. Melbourne, November 1934.

In experiments on the seasonal abundance of thrips in Australia [*cf.* preceding paper] to determine the effect of soil moisture on the viability of the pupal stages of *Thrips imaginis*, Bagn., which, unlike the eggs, larvae and adults, are entirely dependent upon this source to replace their water losses, the 1,400 larvae used were reared in the laboratory on rose buds at a constant temperature of 23°C. (73·4°F.), and since females had been allowed only one day to lay their eggs, they were all at about the same stage of development. One inch of soil passed through a 2 mm. sieve and moistened with water to the required moisture content was placed in 100 cc. beakers. After a rose bud from which the petals had been removed and 20 larvae were put into each of the beakers, they were covered with calico. Two days later the flowers and any thrips that had pupated outside the soil were removed. The beakers were kept at a relative humidity of 97 per cent. The soil moisture content was estimated at the beginning and end of each experiment. For each soil moisture value 100 larvae, divided into

5 lots of 20, were used. At 73·4°F. the majority of adults emerged 6–7 days after the larvae had been placed in the beakers; at 57·2°F. maximum emergence occurred on the 13th and 14th day. The field capacity of the soil, *i.e.*, the amount of water held in equilibrium against gravity, used was estimated at 32–35 per cent. At 73·4°F., in soils with a water content between 25·5 and 85·5 per cent. of the field capacity, the viability of the pupae varied from 81 to 94 per cent. When soil moisture fell to 21·5 per cent., viability dropped to 45 per cent., and to 1 per cent. when soil moisture was reduced to 19·2 per cent. Further, viability fell to 66 per cent. when soil moisture increased to 92 per cent., and to 9 per cent. when it increased to 105·5 per cent. Consequently, 25–85 per cent. of field capacity is the favourable range of soil moisture at 73·4°F. The fall in viability was slightly more abrupt at the lower soil moistures. Similar results were obtained at 57·2°F. The lower limit of the favourable range is about the same for each temperature, but just outside it survival is higher at the higher temperature because development is more rapid. Although the pupae are probably drowned in an excessively wet soil, it is not clear what causes death in dry soil, but it appears that there is competition between pupa and soil for water in some form. The higher survival at higher temperatures suggests that the soil's capacity to absorb the water does not increase so rapidly as that of the pupa. These observations agree in the main with those of Evans [**22** 448], who found that when the soil moisture content was below 25 per cent. of his saturation value at the beginning of the experiment, very few adults emerged.

Of 800 larvae placed over soil with favourable moistures only 17 failed to go below the surface to pupate. When the soil moisture was such that only 1, 9 and 2 per cent. survived, 66, 80 and 82 per cent. of the larvae, respectively, entered the soil.

Swan (D. C.). **The Red-legged Earth Mite** *Halotydeus destructor* **(Tucker) in South Australia: with remarks upon** *Penthaleus major* **(Dugès).**—*J. Dep. Agric. S. Aust.* **38** no. 3 pp. 353–367, 6 figs., 30 refs. Adelaide, October 1934.

Halotydeus destructor, Tucker [*cf. R.A.E.*, A **13** 268; **14** 50; **19** 141; **22** 252, 547, etc.] has sometimes caused serious injury in the last few seasons, chiefly to clover and vegetable crops, in South Australia. Its distribution and synonymy [**22** 265] are discussed, and the eggs, larvae and adults are briefly described. The eggs do not hatch unless they are in contact with adequate moisture, but are very susceptible to excessive moisture. In the laboratory under favourable conditions, eggs 12 hours old at the start of the test had incubation periods varying from 8½ days at 50°F. to 2½ at 75°F. The larvae thrive in damp but well ventilated situations and were difficult to rear in the laboratory. The mites are present in the field from the beginning of the winter rains until early summer, when they succumb to higher temperatures and dessication. The adverse conditions are passed in the egg-stage; the annual plants on which oviposition takes place die at the beginning of summer, and as they disintegrate the eggs become scattered, many of them coming to rest in suitably sheltered positions. Oviposition usually occurs on weeds in moist places. Dissected females contained up to 61 eggs. In

the laboratory oviposition was highest in June–August ; active oviposition decreases as the daily maximum temperature reaches 18–20°C. [64·4–68°F.]. The eggs were laid on the under side of the surface provided for oviposition, and most of them were laid during the day. The contents of the leaf cells are withdrawn by the mites and replaced by air, and damaged areas appear silvered. The known food-plants are discussed.

Sprays or dusts are probably best applied about two weeks after the winter rains have begun, and particular care should be taken to control infestation on young plants. In the laboratory lime-sulphur (1 : 50) killed all examples of *H. destructor* and *Penthaleus major*, Dugès, that were covered with it, but it was necessary to use a spreader. A pyrethrum extract spray killed a large proportion of the mites in the laboratory, but was not so effective as a lime-sulphur spray or as pyrethrum dust. This dust diluted with sulphur (1 : 5) killed the mite rapidly. Derris dust was not so efficient, but it probably retains its toxicity longer.

Short notes are given on the bionomics of *P. major*, and its synonomy is discussed [**22** 265]. Its distribution in South Australia is similar to that of *H. destructor*, but the latter is most often found on broad leaved plants, whereas the former occurs mainly on grasses and does not appear to be of economic importance in this State.

Fowler (R.). **Green Peach Aphis (*Myzus persicae* Sulz.) and its Control.**—*J. Dep. Agric. S. Aust.* **38** no. 3 pp. 376–382. Adelaide, October 1934.

An account is given of the bionomics and control of *Myzus persicae*, Sulz., which has been found since 1924 on peach trees in South Australia, where it has much the same habits as in Victoria [*cf. R.A.E.*, A **22** 482, etc.]. A sexual female may lay 7–13 eggs in 20 days, and a stem-mother may produce up to 60 living offspring. Tar distillate sprays (1 : 35) applied during the winter gave almost 100 per cent. control and were more efficient than petroleum oil sprays, but the latter had a beneficial effect on the trees. The time for winter spraying is discussed, and tables show the results of experiments during 1933. The sprays were applied in June or July, the later applications giving slightly better results. No cumulative injury or injury from frost after the use of tar distillates was noticed.

Insect Pests.—*Bull. Wis. agric. Exp. Sta.* no. 428 (Rep. 1932–33) pp. 97–109, 2 figs. Madison, Wis., June 1934. [Recd. January 1935.]

White grubs, which were more abundant in Wisconsin in 1933 than in any previous year, severely injured over 600,000 acres of pasture land, damaged cereals, and caused considerable soil erosion. The species collected were *Lachnosterna* (*Phyllophaga*) *tristis*, F., the most abundant, *L. rugosa*, Melsh., *L. drakei*, Kby., *L. nitida*, Lec., *L. fusca*, Fröl., *L. ilicis*, Knoch, *L. marginalis*, Lec., *L. futilis*, Lec., *L. implicata*, Horn, *L. forsteri*, Burm., *L. crenulata*, Fröl., and *L. anxia*, Lec. In experimental plots of permanent grass underlaid with impenetrable rock at a depth of 15 ins. and less, half or more of the grubs were killed by winter temperatures because they could not penetrate below the frost line. Comparatively few grubs were present in pastures that had been regularly grazed for 4 years. The weight

of the upper 3 ins. of such sod was heavier than that of areas from which the grass had been cut, and differences in the compactness of this layer, in which the maximum injury occurs, may represent the difference between favourable and unfavourable environments for the grubs. The use of traps was unsatisfactory against the beetles, but over 30,000 Elaterids, which damage maize and pastures, were caught in 38 traps of which 32 were modifications of those used for the Japanese beetle [*Popillia japonica*, Newm.]. As many as 25 per cent. of the white grubs were attacked by *Tiphia* sp. in one locality and some by Asilid larvae. The importance of leguminous plants in pastures of blue-grass [*Poa*] for the control of the grubs [*R.A.E.*, A **20** 430; **21** 515] was confirmed, but they must be thoroughly established before they can resist injury.

Lime-sulphur (1 : 7–8) gave 84·1–94·8 per cent. control of *Coleophora pruniella*, Clem., on apples in early spring, 76·5 per cent. later in spring and 95·8–98·8 in the autumn; sprays should be applied in autumn where possible, but if they are put off until spring they should be applied before the delayed dormant stage and their effectiveness may be increased by the addition of lead arsenate and blood albumen. These sprays are preferable to oils [*cf.* **21** 602], but where the leaf roller [*Tortrix argyrospila*, Wlk.] is a more serious pest than *Coleophora*, a spray of 6 per cent. lubricating or tar oil should be applied against both. Of the parasites of *Coleophora*, *Microbracon pygmaeus*, Prov., attacked the mature larvae [**22** 691], *Trichogramma minutum*, Riley, parasitised the eggs, *Derostenus* sp. parasitised the young larvae mining in the leaves, *Eurydinota lividicorpus*, Gir., attacked them in their small cases, and *Cirrospilus flavicinctus*, Riley, and *Chrysocharis ainsliei*, Crawford, hibernated as larvae in the cases on the twigs.

A 2 per cent. rotenone dust proved at least as effective against cabbage worm [*Pieris rapae*, L.] as calcium or lead arsenate and lime (1 : 1).

Promising results in the control of the potato leafhopper [*Empoasca fabae*, Harr.] were obtained by three applications at weekly intervals of an atomised spray of an undiluted petroleum oil containing 5 per cent. pyrethrum extract. Only 1–3 U.S. gals. were required per acre of potatoes.

Regulations of the Plant Quarantine Station, Trinidad, B.W.I.—4 pp. Trinidad, 1934.

These regulations, which set forth the conditions under which plants or planting material may be imported into the British West Indies and other British Colonies in the Caribbean area, provide for the examination of imported plant material at the Plant Quarantine Station, Trinidad, through which it has to pass, and for the fumigation, disinfection or destruction if necessary of all or part of a consignment, the inspection chamber being equipped for the purpose with a vacuum fumigator, a hot air steriliser, an autoclave and disinfecting fluids. The manner of dealing with the plant material in greenhouses subsequent to the preliminary examination is also laid down. In the case of sugar-cane, the quarantine period in the greenhouses is to extend over 3 generations, the third being grown to maturity, and similar precautions are to be taken with such tree crops as *Citrus*, by budding or other means. Quarantined material required by colonies

other than Trinidad will not be planted out-of-doors in Trinidad, thus obviating the danger of introducing disease from Trinidad into other West Indian islands.

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